U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-269 884

Economic Analysis of Vapor Recovery Systems on Small Bulk Plants

Pacific Environmental Services, Inc, Santa Monica, Calif

Prepared for

Environmental Protection Agency, Washington, D C Div of Stationary Source Enforcement

Sep 76

EPA 340/1-77-013

PB 269 884

ECONOMIC ANALYSIS OF VAPOR RECOVERY SYSTEMS ON SMALL BULK PLANTS

SEPTEMBER 1976

U.S. Environmental Protection Agency
Division of Stationary Source Enforcement
Office of Enforcement
Washington, D.C. 20460

NATIONAL TECHNICAL INFORMATION SERVICE

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA 340/1-77-013	2.
3. RECIPIENT'S ACCESSION NO.	
4. TITLE AND SUBTITLE Economic Analysis of Vapor Recovery Systems on Small Bulk Plants	5. REPORT DATE September 1976
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Pacific Environmental Services, Inc. 1930 14th Street Santa Monica, CA 90404	10. PROGRAM ELEMENT NO.
	11. CONTRACT/GRANT NO. 68-01-3156, Task 24
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Division of Stationary Source Enforcement Washington, D.C. 20460	13. TYPE OF REPORT AND PERIOD COVERED Final Report
	14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES
Project Officer: Mr. John Busik
(202) 755-2560

16. ABSTRACT
This study was conducted to provide economic data and analysis to aid the Environmental Protection Agency in assessing the feasibility and reasonable applicability of vapor recovery systems (particularly bottom-loading) on bulk plants. Other factors which should be used in assessing feasibility and reasonable applicability may be mentioned in this report but are not fully analyzed.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air Pollution Gasoline Bulk Terminals Vapor Balancing Vapor Recovery	Air Pollution Control Stationary Sources Organic Vapors Organic Vapors	

18. DISTRIBUTION STATEMENT Released Unlimited Available free from OAQPS/EPA as supplies permit	19. SECURITY CLASS (This Report) Unclassified	21. NO. OF PAGES 105
	20. SECURITY CLASS (This Page) Unclassified	22. PRICE PC/MF

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

FINAL REPORT

ECONOMIC ANALYSIS OF VAPOR RECOVERY SYSTEMS ON SMALL BULK PLANTS

Prepared for
U.S. ENVIRONMENTAL PROTECTION AGENCY
Division of Stationary Source
Office of Enforcement
Washington, D.C. 20460

by

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Contract No. 68-01-3156, Task Order No. 24

Project Officer: John R. Busik
Environmental Protection Agency

September, 1976

This report has been reviewed by the Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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PREFACE

The purpose of this report is to provide economic data and analysis to aid the Environmental Protection Agency in assessing the feasibility and reasonable applicability of vapor recovery systems on bulk plants. Other factors which should be used in assessing feasibility and reasonable applicability may be mentioned in this report but are not fully analyzed.

1. INTRODUCTION

1.1 PROJECT BACKGROUND AND SCOPE

In specific air quality control regions, Environmental Protection Agency (EPA) regulations for the storage of petroleum products and the transfer of gasoline require bulk plants to control hydrocarbon emissions from their operations. Vapor recovery devices are to be installed and operated so that ninety percent, by weight, of organic compounds in the vapors displaced from tanks during transfer operations will be recovered rather than released to the atmosphere. State implementation plans have included regulations that parallel these requirements, but in some cases, exempt or allow for local exemption of small bulk plants. These exemptions have been generally based on the anticipated economic impact of these regulations.

In response to a request from the EPA, Division of Stationary Source Enforcement (DSSE), Pacific Environmental Services, Inc. (PES) conducted a preliminary investigation of the economic impact of vapor recovery systems on small bulk plants. The purpose was to aid the DSSE in assessing the economic feasibility and reasonable applicability of vapor recovery systems on bulk plants.

The scope of the five week effort was as follows:

(A) Select typical petroleum distribution areas based on a brief survey of distribution channels in the United States

(B) Define typical types of small bulk plants and applicable vapor recovery equipment

(C) Define the total costs of typical vapor recovery equipment

(D) Determine the financial profile of typical bulk plants

(E) Estimate the long and short term economic effects of control equipment

2. SUMMARY

2.1 COST SUMMARY

The installation of vapor recovery on bulk plant facilities will cost an average of

1) for an incoming truck trailer transport, if required
   $5000

2) for filling of storage tanks at small bulk plants
   $3600

3) for filling of storage tanks at small bulk plants and the filling of transportable tanks from such storage tanks

   a) if a loading rack does not have to be modified to permit bottom loading
      $7900

   b) if a loading rack has to be modified substantially, particularly to permit bottom loading
      $41500

4) for an outgoing delivery truck
   $4400/truck

These data are exclusively for vapor balance systems, which are the majority of actual installations. Operating costs are not well established.

2.2 FINANCIAL IMPACT

PES financial analysis concluded that the critical financial factor was the ability to obtain funds for initial investment. Analysis indicates the smallest size operation which could qualify for the loans needed to obtain $30,000 for vapor recovery equipment was a throughput of about 3.8×10^6 liters/yr. (10^6 gal/yr). This throughput level is consistent with what a spokesman for one of the

major oil companies stated was the minimum throughput for a profitable bulk plant.

In Figure 2-1, a histogram of maximum daily throughputs for plants in surveyed areas of California and Colorado is given. Fifty-one percent of these plants have maximum throughputs of less than or equal to 3.8×10^6 liters/yr. (10^6 gal./yr.). These are the plants which our survey shows will not be able to cope with a $30,000 expenditure. Treating the information gathered in this survey as representative of bulk plants throughout the country, it appears that at least half of the small bulk plants in the country would not be able to continue to operate if this magnitude of financial burden were to be placed on them. This could presage the closure of approximately 10,000 plants across the country.

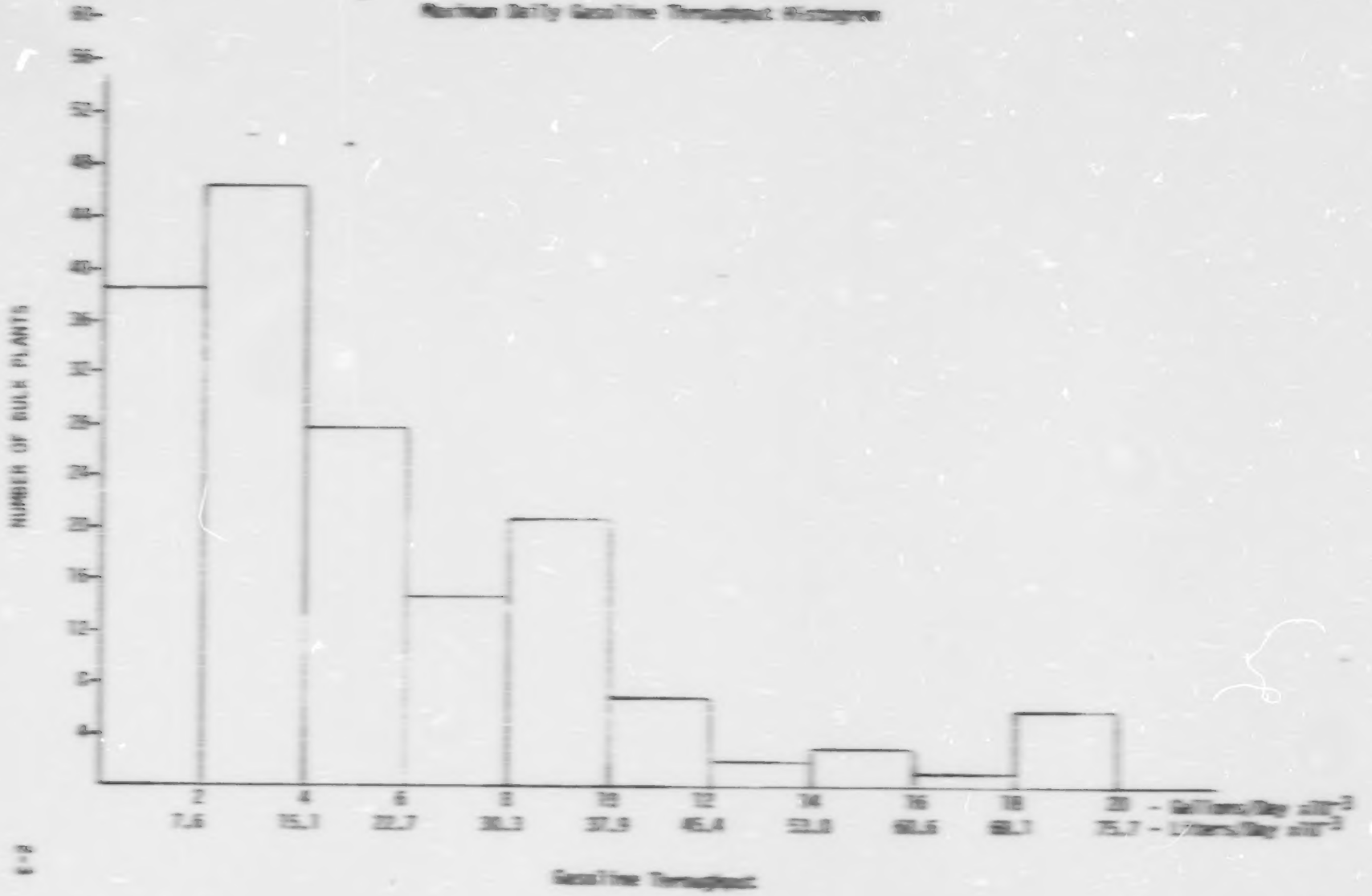
2.3 RECOMMENDATIONS

This cursory survey indicated wide ranges in types of bulk plant operations, in types of vapor recovery installations, in the cost of these installations and in the regulations affecting vapor recovery requirements for the several areas of concern.

There is not yet a complete inventory of all bulk plants in the geographical areas affected. There is also some uncertainty as to the compliance status of bulk plants in these numerous locations. More intensive discussions with the regulating agencies and some field inspections are needed to prepare this type of industry summary.

Bulk plants in this survey were found to have throughputs varying from less than 1900 liters/day (500 gal./day) to more than 9500 liters/day (25,000 gal./day). Their vapor recovery may consist of simple submerged filling of tanks or trucks to vapor balance systems with such secondary recovery systems as refrigera-

FIGURE 2-1



tion or combustion. Also, bottom loading and underground storage were found to be becoming more prevalent throughout the industry.

The most important question to answer is the most difficult and definitely needs substantial consideration separate from the limited scope of work of this project: to what extent will controlling hydrocarbon emissions from small bulk plants reduce the photochemical oxidant levels in surrounding areas? Supplementary information received from the San Francisco Bay Area and the State of Missouri estimated reductions in emissions resulting from changes in the present strategy in these two areas. Appendix C contains comments on proposed amendments to the San Francisco Area regulations. Adoption of the proposed amendments summarized on page C-7 will reduce organic emissions by approximately 664 metric tons/yr.(730 tons/year). The State of Missouri calculates their proposed strategy of requiring a vapor balance system for incoming loads to a bulk plant having a throughput of greater than 1.1×10^6 liters/mo.(300,000 gal/mo.)would reduce hydrocarbons emitted from bulk plants in the St. Louis area by 44.6% from 617 metric tons/yr. (679 short tons/yr.) to 342 metric tons/yr.(376 short ton/yr.). The total hydrocarbon emissions in the St. Louis metropolitan area were approximated at 110909 metric tons/year (122000 tons/yr.). (See Appendix D). These two limited examples are intended only to indicate the critical lack of information and the need for other studies to be made to determine the impact of vapor control strategies on the oxidant levels in the numerous areas of concern.

How many plants will close because of the expense of attempting to comply with vapor recovery regulations? Is there a specific limit of gasoline throughput or storage capacity any other measure below which vapor recovery can be waived. There will be plant closures regardless of what vapor control strategy is adopted. The

average cost of adopting storage tanks so vapors will not be vented to the atmosphere when an incoming gasoline shipment is unloaded was found in this survey to be about $4,000. Even though this is a relatively low cost, there are going to be firms which will need to spend much more than this and may not be able to afford it. Overall, the installation of a vapor balance system for receiving shipments at a bulk plant appears to be a reasonable, feasible recommendation.

The cost of equipping loading racks and delivery trucks has been indicated to be prohibitive to approximately half of the bulk plant operations. The difficulties presented by the closing of this many plants could have a serious impact on the availability of gasoline to small commercial establishments and to agri-businesses.

Secondary vapor recovery will add even more to the cost burden of bulk plant opeation. Secondary systems appear to add little to transfer recovery efficiency while incurring cost, energy consumption, and safety penalties.

At this time the impact of proposed exemptions of bulk plants having a throughput of less than a specified amount is unclear. Such a regulation could encourage a plant owner to try to operate several small facilities rather than one larger one in order to circumvent existing regulations. It also may encourage service stations to be supplied by bulk plants in order to be exempt from regulations. Although some adverse reactions have been seen in California, no large scale trend has been detected.

Primarily because the cost of vapor recovery would be a small increment of the cost of building a new facility, it is quite feasible to require new bulk plants to install vapor recovery on both incoming and outgoing loads during the original construction.

3. BULK PLANT OPERATIONS

3.1 BRIEF HISTORY

Bulk plants at one time were a major link in the wholesale distribution of gasoline and petroleum products (Ref. 6 and 7). Forty years ago, bulk plants received gasoline by rail tank cars (Ref. 11) shipped from relatively few refineries or terminals. For example, an operator in San Diego County at one time received gasoline by rail from San Francisco. From the bulk plant, the majority of the gasoline went to retailers (service stations).

3.2 GENERAL INDUSTRY DESCRIPTION

Today, the rail delivery of gasoline has nearly disappeared even though many bulk plants are still located near railroads. Typical delivery of gasoline to the bulk plant is by tanker trailer. This shift in transport has allowed larger accounts not located near the railroad to receive deliveries direct from a pipeline terminal or a refinery. This is especially true for gasoline retailers (service stations).

Thus, today the bulk plant is primarily a specialty petroleum products wholesaler/retailer providing the service of customer delivery to those small accounts that 1) find it inconvenient to bring small tanks to a large outlet, 2) have fixed storage tanks of low capacity or 3) desire quick delivery due to highly variable demand. In addition, bulk plants may provide high delivery rate equipment to those customers who bring tanks in to be filled.

Figure 3-1 presents a schematic of that portion of the

gasoline distribution network most directly related to bulk plants. The major competition for bulk plants is direct bulk sales from the refinery or terminal. Some advantages of a bulk plant over direct bulk sales are 1) closer proximity to customer 2) faster response to variable customer demand 3) ability to use smaller trucks able to reach off-road customer locations, and 4) ability to store and supply other petroleum and related products required by customer. Some disadvantages of a bulk plant compared to direct sales are 1) higher capital costs, 2) increased labor involved in transfer, storage and filling of account trucks, and 3) small account truck size may hinder ability to deliver to higher demand accounts.

A second potential source of competition for bulk plants is large retail outlets. Some advantages of a bulk plant over a retail outlet are 1) convenience or necessity of "home" delivery, 2) higher delivery flowrate capability for bulk deliveries, 3) a potential wholesale price and 4) a potential lack of road taxes. Disadvantages of bulk plants over a larger retail outlet include: 1) high capital costs, 2) increased labor costs for account truck filling and transporting gasoline to site and 3) inability to service user vehicles.

3.3 OWNERSHIP AND OPERATION

Although operation and ownership of bulk plants include cooperatives and salaried employees, the independent jobber and commission agent are the predominant types. The typical independent jobber owns the equipment and structures at his bulk plant, the inventory and rolling stock. He contracts directly with the oil company to secure his gasoline at the most advantageous price and then sells the gasoline to his customer at terms he and the customer negotiate. He may market a nationally known brand of gasoline and related products, but he may market under his own brand.

A significant number of jobbers also own more than one plant and service station. A typical commission agent does not own the land, structures or equipment at the bulk plant, but operates it for a major integrated oil company. He will generally own his account trucks and may contract with customers, but he operates within the framework of the contract with the major oil company which is supplying his products.

3.4 TYPICAL BULK PLANT AND OPERATION

The description of a typical bulk plant is based primarily on a survey and inventory of plants in the Denver, Colorado and San Diego and San Joaquin valley areas of California. Census data (Ref. 1) indicate that this description is generally valid for other parts of the country as well.

In surveying bulk plant operations, only 3 of 167 responding were found with throughputs greater than 19,000,000 liters/year (5,000,000 gal./year). Assuming working hours to be 5 days a week, 50 weeks a year, this means the overwhelming majority of bulk plants have a daily throughput of less than 75,700 liters/day (20,000 gal./day). Thus, for purposes of this study, a small bulk plant will be considered to be a wholesale distributor of less than 75,7000 liters/day (20,000 gal./day). Thus, for purposes of this study, a small bulk plant will be considered to be a wholesale distributor of less than 75,7000 liters of gasoline each day. It should also again be emphasized that all bulk plants surveyed received product solely by truck.

The majority of bulk plants are located in or near towns or small cities. Storage at a typical small bulk plant consists of about five old, above ground, fixed roof storage tanks of approximately 49,000 to 76,000 liter (13,000 to 20,000 gallon) capacity. Tanks are generally painted white or silver, 3.2 meter in diameter

and 6.1 to 8.8 meter high (10½ ft and 20 to 30 ft). Only about three storage tanks are used to store gasoline, however. The remainder of the tanks, and drum storage, are used to store other petroleum products, such as diesel fuel, fuel oil, kerosene, weed oil, LPG and lubricants. Underground storage tanks and above ground horizontal tanks, however, represent significant minorities. Underground tanks tended to be more prevalent in the larger cities, were newer and smaller in capacity, typically 38,000 liter (10,000 gallon) capacity. Census data (Ref. 1) indicate that the storage capacity for non-gasoline products, such as fuel oils, is higher in other areas of the country, but that a major portion of the business is still gasoline.

Products are generally pumped into and out of storage tanks with the same pump, typically at 380 liters/min (100 gpm), through a total length of approximately 30 meters (100 ft) of 5.1 to 7.6 cm (2 to 3 in) pipe. Often incoming loads are delivered after normal business hours. Generally each transport will deliver about 34,000 liters (9,000 gal) of one grade of gasoline. Frequency of incoming loads for each grade of gasoline stored may vary considerably based upon seasonal agricultural demand.

Outgoing loads are generally delivered from one top loading rack to the account trucks. Truck capacities are generally 3800 to 7600 liters (1000 to 2000 gal.) with 4 compartments. Account trucks may load several times a day. Contents of each compartment vary with demand, but not all compartments will normally contain gasoline. In addition to truck deliveries, some accounts may bring their small tanks or drums to the plant for refilling. As shown in Figure 2.1 at 80% of the bulk plants gasoline throughputs are under 38,000 liters/day (10,000 gallons/day) and at 50%, the throughput is less than 15,000 liters/day (4,000 gallons/day).

Data gathered in this survey indicate 60%, on the average, of bulk plant sales gallonage is to agricultural accounts whose storage is all in tanks of no more than 550 gallons. Since the 550 gallon storage tank is currently exempt from vapor recovery regulations, it is important to know how much of a bulk plant's sales are to this type account. Bulk plants in the more urbanized Denver area sell slightly less gallonage--43%--to these small accounts, but this is still a significant portion of their business. On the average, 20% of the gallonage a bulk plant delivers is sold to service stations. The remainder of bulk plant accounts are with commercial establishments and agricultural accounts with larger storage tanks. The owners were reluctant to describe accounts in specific detail.

Other typical activities pertinent to vapor control emissions include: periodic measuring of tank level and temperature by opening hatch and using plumb bob, thermometer and measuring tape or stick; verification that incoming tanker trailer is empty after delivery by opening truck hatch for visual inspection; priming of pumps and elimination of air in lines by venting lines to the atmosphere and flowing until gasoline appears at the vent; some spillage; "as required" maintenance of pumps, dry breaks, hoses and valves resulting in questionable containment of vapor and some leakage from liquid components.

The "as required" maintenance is derived from on-site inspections and the phone survey results. Results include: 1) only two operators indicated any maintenance had ever been performed on pressure vacuum relief valves, 2) visible gasoline leakage from shut-off valves and quick disconnects, 3) rusted and painted-over condition of typical pressure vacuum valves, 4) hydrocarbon odors when on the tops of tanks, 5) an observed loose vapor hose fitting, and 6) stained areas on the ground where leakage and/or spills have occurred.

3.5 INDUSTRY TRENDS

A. Number of Bulk Plants

Gasoline bulk plants appear to be diminishing in importance in the marketing sector of the petroleum industry. This conclusion is reached based upon: 1) Reference 1 (1972 Census Data) versus Reference 8 (1975 Survey By National Petroleum News) showing a loss of nearly 2,000 bulk plants nationwide in a few years, 2) Reference 4 (Arco Actions) and 3) Bulk plants recently closed during survey in San Diego, San Joaquin Valley and Denver AQCR's. Reasons for this decline are varied, but appear to be related to economic factors.

These economic factors appear to be a result of the extra cost to transfer gasoline from truck to a storage tank and then back to another truck. Economies of labor and capital are derived if the initial tank truck can deliver directly to an account. In addition, traditional customers may be declining. Small service stations are being replaced (or eliminated, per Reference 8) by larger outlets serviced from a terminal or refinery. Many agricultural accounts now primarily depend upon diesel fuel burning and electrically powered equipment. (Reference 2). Typical agricultural accounts are now large. For example, a typical San Joaquin Valley farm is 1500 acres, Reference 2, and may be able to obtain deliveries from a terminal or refinery.

B. Profitability

There appears to be a decrease in profitability in bulk plants. This conclusion is based upon 1) statements by independent operators during survey, and 2) difficulty in selling bulk plants as a going business (Reference 10). The reasons for this decline are also varied, but again appear to be related to economic factors. Economic factors may include: 1) a shift in profit emphasis by major oil companies from expanding sales to maximizing the profit per gallon, 2) an increase in wholesale prices, especially to independent jobbers, (One independent operator claimed the wholesale price he paid for gasoline was

within one cent per gallon of retail gasoline price in the area) and (3 competition from reduced margin self service stations.

C. Disposal of Commission Agent Operated Bulk Plants by Major Oil Firms

Reference 4, as well as survey results, show a larger decline in major oil company-owned bulk plants than the overall decline. Typical disposal (Reference 10) involves offering the plant at a reasonable price to the commission agent. If agent elects not to purchase the plant, plant is generally dismantled and the land is sold. Again, economic factors appear to be responsible for disposal by major oil companies.

D. Keylock

A small number of bulk plants surveyed were planning to install Keylock Systems. This conversion to a specialty, "self-service" retail outlet yields a very low cost margin potential but customers must be able to pick up the product. The fate of Keylock Systems again appears to be economics related, that is, whether the price difference will attract a sufficient number of customers to pick up the product.

E. Storage Capacity

Short term reasons to maintain or expand bulk plants are 1) the desire to increase emergency fuel storage capabilities should an oil embargo or other shortage occur and 2) initial establishment of no-lead distribution. No-lead gasoline demand may initially be for small quantities, also a temporary lack of separate pipelines may lead to distribution through existing bulk plants. These conclusions are based on 1) survey results, 2) observed tank truck deliveries of no-lead to terminals, and 3) salvaging, if possible, and moving of storage tanks from closed bulk plants (Reference 10). These counter trends, however, do not appear to strongly influence the fate of bulk plants.

3.6 VAPOR RECOVERY REGULATIONS

EPA, state and local air pollution regulations are not always consistent with respect to bulk plants. For specified AQCR's, EPA presently requires bulk plant control of emissions for incoming, outgoing and customer deliveries.* Exemptions are limited. Present California ARB regulations, however modify exemptions.** Local county APCD's may further modify these regulations. Bulk plant operators surveyed in California were generally confused about 1) status (exempt or non-exempt), 2) whether they must comply with state or federal regulations, and 3) future changes.

Some bulk plants owned primarily by major oil companies have installed or are planning to install vapor recovery in locations where bulk plant could have been partially exempt from vapor control regulations. These are generally major renovations costing in the order of $100,000. Renovations in the cases of three particular plants in central California have included: 1) installing a vapor balance system for incoming loads, 2) replacing existing above ground tanks with new underground tanks, 3) converting loading rack to bottom loading, 4) replumbing the facility, usually with larger diameter piping, 5) making certain spill control and other regulations are complied with, and 6) converting all trucks to bottom loading with vapor recovery.

3.7 OTHER FACTORS AFFECTING BULK PLANTS

A. OSHA Requirements

OSHA spill prevention requirements requires draining and diking of aboveground storage tanks. Associated requirements include explosion proof pump motors, safe walking and working surface and additional safety equipment for personnel and facilities to comply with the Occupational Safety and Health Act (Reference 3). The additional expense of even very low cost vapor recovery equipment can be the "straw that breaks the camel's back."

*Title 40, Part 52 of the Code of Federal Regulations
**Suggested Vapor Recovery Rules Approved April 17, 1975

B. FEA Regulations

Federal Energy Administration (FEA) regulations can also have a strong impact on the future of bulk plant operations. Title 10, § 211.9 of the Code of Federal Regulations (1976 edition) requires the FEA must approve of any changes in gasoline supply to "all wholesale purchaser-resellers and all wholesale purchase-consumers" except where there is mutual consent of the supplier and wholesale purchaser to terminate the relationship. Discussions with the FEA (Reference 5) indicated changes to individual wholesalers are generally approved as long as the total supply to a region is not significantly affected. These regulations appear to promote the status quo relationship between the supplier and the wholesaler, but their effectiveness is unclear.

C. Miscellaneous

Bulk plant operators are active politically (Reference 12) and are involved with the appropriate regulatory agencies to minimize the impact of regulations including any vapor control strategy. This activity is in conjunction with the strong desire of small farmers to maintain low fuel costs. Other miscellaneous factors noted by operators during the survey included: 1) fire code regulations, 2) theft and 3) availability of insurance at reasonable rates.

4. HYDROCARBON CONTROL AT BULK PLANTS

4.1 CONTROL TECHNOLOGY

4.1.1 Filling Losses

Neglecting spillage, two major sources of loss of gasoline vapor during transfer are: 1) venting to the atmosphere the volume of gases (air and hydrocarbons) displaced by the entering liquid and 2) filling in a manner which creates turbulence (splash loading) thereby resulting in increased vaporization rates and liquid droplet entrainment in the vapor space.

Among current methods of eliminating venting losses during filling, the most common is the installation of vapor transfer lines between the vapor spaces of a tank being filled and one being emptied. This permits vapor balancing between the two tanks. In addition to minimizing hydrocarbon losses this procedure tends to minimize air input into the tank being emptied.

Other methods of controlling emissions involve processing or vacuum assisted collection of vapors, in conjunction with a balance system. However, very little application of these methods to bulk plants has been found. This is generally due to high cost, safety problems and operating problems. At the time of the survey, only one out of ten bulk plants in San Diego County had an operating secondary system, and it did not recover any gasoline. Impact of these other methods will, therefore not be considered further.

Submerged filling of gasoline therefore, is the common method of reducing turbulence and minimizing vaporization of droplet entrainment. It is also the recommended safety practice of the National Fire Protection Association (Reference 9) and NIOSH (Reference 3). The costs to install submerged fill tubes on bulk plant tanks and trucks are generally small enough to be insignificant. Many facilities have already installed these drop tubes and some customers have done so as well. Therefore, only the impact of vapor balance systems for incoming and outgoing loads will be considered.

4.1.2 Breathing Losses

Storage tanks are subject to evaporation or standing losses due to volatility of the material stored, type and condition of the tank and its appendages and prevailing meteorological conditions. The simplest methods for reducing these breathing losses are to 1) inspect and repair leaks in the tank and fittings, 2) paint the tank with silver or white paint where possible, 3) assure that vent valves do not

leak and, 4) set the pressure and vacuum relief settings to minimize breathing. The broader the bank for the vent valve settings, the lower will be the breathing losses.

Another method for preventing vapor loss is to install vapor recovery equipment at the vent valve. For vapor recovery, the vented vapor must be able to be condensed and recycled to the tank or be collected and regenerated. For prevention of pollution only, the vapors can be combusted or collected and disposed of in some approved manner.

Regulations do not generally require specific control of breathing losses. No further consideration will therefore be given to these control methods.

4.2 INITIAL COSTS

4.2.1 Truck-Trailer Transport

Cost estimates for installing vapor recovery and bottom loading on a supply truck and trailer range from $1,000 to $1,600 per compartment, with the total cost ranging from $3,500 to $10,000. The most commonly quoted cost was $5,000 (Table 4.1), which would be for four compartments at $1,250 per compartment. Generally, trucks originally designed for top loading are also modified to allow for bottom loading at the time vapor recovery system is installed. This is probably responsible for the higher quotes received from operators, since addition of vapor recovery only is estimated to cost about $2,400.

The truck delivering to the bulk plant is frequently owned by the major oil company who supplies gasoline to the plant or is a commercial carrier. The transport, regardless of its ownership may also often be used to haul other products which may also need to have a vapor control system. For these reasons, the cost of installing vapor recovery on a truck trailer transport is not being included as

Table 4.1 [illegible] ($ x 10^{-3})

[illegible]	[illegible]														
	[illegible]														
	Vapour Recovery and Bottom Loading			Vapour Recovery for Top Loading Loads			Vapour Recovery for Both Top & Bot. Loads			Vapour Recovery and Bottom Loading Rack			Vapour Recovery and Bottom Loading		
	Low	Ave.	High	Low	Ave.	High	Low	Ave.	High	Low	Ave.	High	Low	Ave.	High
Jetfoil	3.5	5.0	6.5	0.65	3.4	6.0	6.4	7.3	9.0	26	41.0	65	2.1	4.3	9.0
Rigid Hull Ca.	—	—	—	0.6	4.3	7.6	—	—	—	21	48.0	55	3.5	4.6	6.0
Contractor [1]	0.6	5.7	10.0	0.2	3.6	10.0	6.0	9.0	11.5	4.5 (20.5)	16.7 (27.3)	33	2.5	4.8	7.5
PLANT TARIFF IN [illegible] ($/L/HR)															
[illegible]	Not applicable			3.6			7.9			41.5			4.8 [2]		
[illegible]	Not applicable			3.6			7.9			41.5			8.6		
[illegible]	Not applicable			3.6			7.9			41.5			26.4		

[1] values in parentheses from existing [illegible] data, which was since conversion of modern jet loading facility to bottom loading

[2] 1 truck for [illegible] Lit transport, 2 trucks for [illegible] Lit and 5 trucks for [illegible] Lit transport

part of the cost that typical bulk plants will need to bear to equip their facilities with the necessary vapor control system.

4.2.2 Plant Costs

Gasoline storage capacity at bulk plants surveyed has ranged from 22,706 to 492,100 liters (6,000 to 130,000 gallons). The largest tank located held 151,400 liters (40,000 gallons); most hold 49,200 to 75,750 liters (13,000 to 20,000 gallons). The majority of tanks are presently above ground with underground tanks of typically 37,900 liters (10,000 gallons) capacity located primarily in the largest cities. Several costs may be involved within the plant including the installation of:

1. Vapor recovery for incoming loads
2. Vapor recovery for incoming and outgoing loads
3. Other modifications, such as bottom loading

Cost estimates for installing vapor return for incoming loads have ranged from a few hundred dollars for purchase of pipes, fittings and self installation to $10,000. An average estimate for self installation is $1,500 and for contractor installation an estimated average range of $3,400 to $4,300 depending on the source of information (Table 2.1).

Only a few data points were obtained for costs of installing vapor recovery for both incoming and outgoing loads without also converting to bottom loading but indications are that average costs will be approximately $4,000 higher than for installation of vapor recovery systems on incoming loads alone. (Table 4.1)

The great majority of data indicated that if vapor recovery were required for outgoing (loading of account trucks) transfers, account trucks would be converted from top loading to bottom loading. This conversion generally requires a complete replacement of the loading rack (buried piping, meters, fittings, pumps, electrical controls, and interlocks).

Estimated installation costs of plant vapor recovery and bottom loading systems for incoming and outgoing loads range from $4,000 to $85,000. The most common costs ranged from $30,000 to $50,000. This extremely wide range of cost estimates reflects the considerable differences among bulk plants. Some of the variations between installations which can affect cost of vapor recovery are as follows: 1) number of tanks, 2) location of tanks, i.e., above or below ground, 3) amount of pipeline between tanks and loading rack which would need to be replaced or moved, 4) modifications to the loading rack required or desires, e.g. conversion from top loading to bottom loading , 5) availability and cost of contractors and labor force, 6) amount of ancillary work to be done, e.g., excavation, repaving, pump purchases.

Thus, although the cost data does not appear to strongly correlate with plant characteristics of throughput or size, certain factors have become apparent.

Age of the facility generally increases modification costs. Tanks would normally be above ground for older plants and require longer vapor transfer lines. These older tanks may also require sealing of leaks to permit operation of vapor transfer and modifications to the structure to permit installation of pipes and fittings required for vapor conservation systems. More modifications and modernization would probably also be required at the truck loading and unloading racks, leading to higher costs for older bulk plants.

The plant modification which critically affects the cost of outgoing vapor recovery systems is the conversion of loading racks to bottom loading for outgoing trucks. Integration with customer and supplier vapor recovery requirements, improved vapor recovery efficiency, and costs similar to top load vapor recovery systems are reasons given for this bottom loading capability. One manufacturer has stopped production of vapor rscovery equipment for top loading installations (EMCO Wheaton top loading vapor recovery loader - E295). The apparent

cost of this plant modification is upwards of $20,000 which includes renovation of the loading rack. A typical low cost conversion was accomplished for $4,500 at a relatively modern (approximately 8 years old) facility with underground tanks where minimal modification (essentially only attachment of an extension hose) was made to the top loading rack.

Whether to include the cost of bottom loading conversion in the cost of vapor recovery is open to question. In addition to the aforementioned reasons related to vapor recovery, other valid reasons to install bottom loading exist. Independent of vapor recovery, these reasons include: 1) safety--the potential for falls is eliminated, 2) reduced labor costs--operator is not required to climb to the top of the truck to open and close hatches, 3) versatility--allows the loading of account trucks at bottom loading terminals, and 4) increased flow-rate--potentially reduced loading and unloading times from modernized equipment and enlarged pipe diameter.

Another plant modification which has been made in a number of plants at the same time vapor recovery was installed was relocating the storage tanks underground. This could cost an additional $25,000 to $40,000 depending on the number of tanks. Installation of underground storage does not appear to be related to compliance with vapor recovery requirements and will not be included in vapor recovery costs.

Estimates of initial costs for contractor installations at the plant are somewhat higher for the major oil companies as compared to the jobbers. This higher cost for the major oil companies appears to be the result of installing systems with more controls and versatility than that put in by jobbers, the hiring of larger contractors to install systems in all plants within a given region and possible payment of travel and per diem as the contractor moves from plant to plant. The smaller jobbers also tend to do by themselves what they can do to decrease costs.

For the purpose of this study, the full cost of converting to bottom loading will be included in the cost of vapor control. The reasons for this inclusion are: 1) conversion to bottom loading at small throughput (under 11,400 liters/day) bulk plants surveyed occurred only when required by vapor recovery regulations, and 2) a majority of plants will convert to bottom loading when required to install vapor recovery systems to control losses from loading outgoing delivery trucks. Future studies may be able to refine the actual vapor recovery cost to include only a portion of the bottom loading modification costs.

4.2.3 Delivery Trucks

For small bulk plants, typical account trucks have a capacity of approximately 4,500 liters (1,200 gallons) which deliver to accounts. Cost estimates to install vapor return on these delivery trucks have ranged from $2,000 to $9,000, with the average cost about $4,400. As in the case of delivery transports, higher costs are associated with the conversion of the truck from top loading to bottom loading.

4.2.4 Installation Costs Based on Plant Throughput

Plant costs for the installation of vapor balance systems have been assumed to be similar for plants of various sizes; thus average costs were used regardless of throughput as shown in Table 4.1. Gasoline throughputs of 3,800, 15,100 and 76,000 liters per day were assumed to require one, two and five delivery trucks, respectively. This is based on survey results of 1.4 trucks for gasoline throughputs of 1-7,600 liters (1.2 trucks for Denver AQCR), 2.1 trucks typical overall average and 5.2 trucks for plants with gasoline throughputs above 60,600 liters. From data obtained thus far, an average cost for plant conversion to vapor recovery and bottom loading would be $41,500 plus $4,400 per truck. A point of comparison is an estimate by Mr. Maple (FEA) of $50,000 to $80,000 for conversion of a plant with 1.9 to 3.8 million liters/yr (0.5 to 1 million gals/yr) throughput and three trucks to meet EPA and OSHA requirements (Reference 5).

4.3 OPERATING AND MAINTENANCE COSTS

Only a few bulk plant operators have had long term experience with vapor recovery systems. Thus cost information is limited Maintenance costs for vapor balance and bottom loading are generally expected to be minimal since major additions are in the form of fixed piping and valves. Transfer hoses and mating fittings will require replacement. Installation of automated controls for loading and unloading of gasoline may impose additional maintenance requirements.

Operating costs were not directly obtainable. However, 13 of 25 bulk plant operators who had their equipment modified and one major oil company representative have indicated an increase in time required to transfer gasoline. This estimated increase in time ranged from 10% to 100%. Some operators reported a decrease in time required to transfer gasoline due to upgrading of the transfer platform, pumping station and line sizes.

Based upon their experience with balance systems in service stations, one major oil company estimated the annual costs of a balance system in a bulk plant to be apportioned as follows:

Expenditure	Annual Cost of Operation
Interest (8 years at 10%)	6.2% of initial system cost
Depreciation	12.5
Property taxes	2.5
Maintenance	3.0
	24.2% of initial system cost

A California operator, with sales of 5.7×10^6 liters gasoline/year (1.5×10^6 gallons/year), estimated his costs were 15% of gross. Installing a vapor balance system on his facility will initially cost $45,000. If the annual cost of this system is approximately one-fourth the initial costs, his total expenses will increase to 16.5% of gross.

Thus, although miscellaneous costs for vapor recovery may be very significant, it appears that the primary impact is directly related to the initial cost. The conclusion is based on, 1) low maintenance required for piping, 2) trend to replace low flow rate equipment and lines when vapor recovery is installed, and 3) no observed change in accounts served per truck. Therefore, miscellaneous costs, except those directly related to initial costs, will be ignored.

5. PROJECT APPROACH AND METHODOLOGY

5.1 QUESTIONS ABOUT BULK PLANTS TO BE ANSWERED

5.1.1 Selection of Study Areas

Eighteen geographical areas across the country are presently affected by the promulgation of regulations requiring bulk plant operations to use vapor recovery systems for better control of hydrocarbon emissions. These include the air quality control regions surrounding Los Angeles and the Sacramento and the San Joaquin Valleys in California; Denver, Colorado; Washington, D.C.; Baltimore, Maryland; Boston, Massachusetts; New York City, New York; Philadelphia and Pittsburgh, Pennsylvania; Dallas-Fort Worth, Houston-Galveston, San Antonio, Austin and El Paso, Texas; Marion County, Indiana; and San Diego County and the San Francisco Bay area, California.

Inquiries were made in all these areas to first determine exactly what is required in each area and then to find out which bulk plants were affected. In doing this, P. Roberts of the Texas State Agency said public hearings are just now being held to discuss proposed regulations in Texas and for this reason no bulk plant had yet taken any action to modify a facility. Only one plant in Maryland areas of interest has installed a vapor balance system, according to a survey provided by D. Andrew of the state agency. No plants meeting the definition of receiving product solely by truck were identified in Boston and Connecticut areas by the air pollution control

agencies concerned with these areas. No response was received from the New York and New Jersey agencies. These portions of the country were omitted from further investigations because of the sparseness of information.

5.1.2 Physical Description of Plants

An adequate physical description of a bulk plant included the number and capacity of storage tanks, whether they are above or below ground, the number and capacity of trucks, and the type of loading used. The vapor recovery system would be described by type, manufacturer and installer. Bulk plant owners and operators were the sources of information.

5.1.3 Bulk Plant Operations

Questions to be answered concerning a bulk plant's operation focused on sales, expenses and profits. Gasoline throughputs, margins, operating expenses, gross or net profits, net worths, original investments, break even points, and associated revenue sources were all information requested from the operators and owners.

5.1.4 Cost of Vapor Recovery

It was planned to try to determine the cost of buying and installing each increment of equipment required in the plant and the cost of modifying trucks. Among operating and maintenance costs were included changes in taxes, insurance and in the time required to load or deliver product.

Cost data were obtained from owners and operators, equipment manufacturers and contractors.

5.1.6 Financial Impact of Vapor Recovery

The financial impact of installing vapor recovery on specific bulk plants was examined by seeking information from the operators on costs, income, assets and debts. The owners were asked for their own evaluation of what each could afford. An attempt was also made to learn how the bulk plant owners' actions would affect customers.

Because of the anticipated difficulty of obtaining information on a sufficient number of individual plants, financial statements were created for seven hypothetical, but probable operations, based upon summary data published by Robert Morris Associates for bulk petroleum wholesalers. An estimation of the financial impact of vapor recovery expenses in excess of $30,000 by each of the seven firms could then be made. The results and a detailed description of the evaluating process is in Section 7.

5.2 INFORMATION REQUESTED

5.2.1 Information Requested From the Major Oil Companies

The first task was to determine how each company managed bulk plant operations. As was stated earlier, an oil company may choose to distribute gasoline through commission agents or through independent jobbers or both. Nationwide 58% of the bulk plants are operated by independent jobbers (Reference 6). Here a topic of considerable importance was a company's policy concerning future bulk plant operations. Questions were asked about the number of plants owned and supplied and any plans to close or sell plants or expand operations or make major modifications to existing facilities.

Cost information was requested, as was information on how the cost burden would be shared.

Financial data desired included margins, profit rates, income, assets, expenses, debt structure and rate of return on investments.

Questions on the economic impact centered on learning what factors influenced decisions to install vapor recovery at any given plant and on learning what effects plant closures would have on the distribution system and the consumer.

5.2.2 Information Requested From Individual Bulk Plant Operators

Both distributors and jobbers were contacted. A brief description of the plant and the vapor recovery system installed were obtained as introductory information.

In gathering cost data, an effort was made to separate installation costs, maintenance costs and operating costs.

Financial data similar to that requested from the major companies were also sought from the independent jobbers.

The economic impact focused on what each individual could afford, how he could finance the equipment and what would happen to him and his customers if he were unable to stay in business.

5.3 SOURCES OF DATA

Phone contacts were the principal means of interviewing people throughout the industry. Written communications and some personal interviews supplemented the data gathering portion of this task. Agencies, associations and others contacted included:

1. Various state and local air pollution control agencies (11)
2. Industry associations (8)
3. Major oil company representatives (16)
4. Bulk plant operators (50)
5. Miscellaneous state and federal agency representatives (5)
6. Principals involved in an Arco-bulk plant operators suit (3)

A list of the pertinent contacts is presented as Appendix B.

Literature searches were conducted at University of California at Los Angeles Graduate School of Management library and the Public Affairs Library. Among information sources used were the 1975 statistics compilation of Robert Morris Associates, Standard and Poor's business index, and financial summaries of individual companies compiled by Dun and Bradstreet.

5.4 DATA GATHERING

5.4.1 Use of a Questionnaire

Two questionnaires were prepared for use with the majority of verbal discussions: one is directed toward the individual operator; the other, toward the major oil company who markets through consignees or distributors. A sample copy of each is given in Appendix A.

5.4.2 Problems Encountered in Obtaining Responses

In telephone communications with the major oil companies, several were reluctant to give more than the most general information. Written requests were more productive, although the time constraints of this task made it somewhat difficult to receive a response in time for inclusion in this report. A personal meeting with two representatives enabled PES staff to obtain answers to most questions and to be offered additional, future assistance by one company.

Overall, any generalizations or conclusions derived from data supplied by the major oil companies are based on the replies of only a minimum number of divisions and companies.

The bulk plant operators were contacted solely by telephone. Understandably, several did not want to discuss their financial situation.

Primarily because most systems have been installed in 1976, very few operators were able to make a reasonable estimate of how maintenance and operating costs have changed as a direct result of vapor recovery installations.

Quite often operators reported the total cost of all plant and truck changes made at the time vapor recovery systems were installed. There is a problem in determining the need for such associated plant changes as installing tanks underground, buying new trucks instead of modifying older ones and installing bottom loading facilities.

5.5 SUMMARY OF RESPONSES TO QUESTIONS

5.5.1 Expenditure Limitations for Bulk Plant Operators

Asking the hypothetical question "what is reasonable cost of vapor recovery equipment" resulted in very few answers. The smallest operators are willing to consider $1,000 or $2,000 and maybe even $3,000. The larger operators will consider up to $20,000.

Asking the hypothetical question "if vapor recovery initially cost $20,000 and operating costs increased 20%, could you stay in business," over one-third emphatically stated they would have to close and over 15% had serious doubts as to their fate. These responses are tabulated in Table 5-1 and show that not one independent jobber who sold 23×10^6 liters (6 million gallons) annually or less of gasoline felt that they would remain open if vapor recovery systems cost $30,000. Thus, even very large throughput bulk plants would be subject to financial hardship. The maximum expendable cost for operators handling 3.8×10^6 liters (one million gallons) of gasoline annually was $20,000. One operator was already disposing of his plant saying that the costs were too high.

Excluded from this table are three plants at which a major integrated oil company had installed recovery systems.

Table 6.1 SUMMARY OF BULK PLANT OPERATORS RESPONSES TO QUESTION ABOUT THE MAXIMUM AFFORDABLE COST OF VAPOR RECOVERY

Gasoline Throughput		Cost of Vapor Recovery System	
10^6 liters/yr (10^6 gal/yr)		Will Close Plant	Can Spend
		($ X 10-3)	
0.95	(0.25)	20	-
1.9	(0.5)	20	$10
2.7	(0.7)	20	-
3.8	(1.0)	10	-
3.8	(1.0)	-	20
3.8	(1.0)	20	10
5.3	(1.4)	-	20
5.7	(1.5)	30	20
5.7	(1.5)	Closing (Too Expensive)	
6.4	(1.7)	-	10 to 20
6.8	(1.8)	30	-
7.6	(2.0)	30	20
7.6	(2.0)	20	10
7.6	(2.0)	20	-
11.4	(3.0)	30	-
18.9	(5.0)	30	20
22.7	(6.0)	20	10
22.7	(6.0)	-	20
22.7	(6.0)	20	-
64	(17.0)	-	30
95	(25.0)	-	30+

Most operators who replied that they would have to close said they would go into some other petroleum industry such as selling gasoline retail or continue to sell other petroleum products wholesale. A few said they would retire. Their customers would have to find new supplies on their own initiative. This would probably mean finding another bulk plant to deliver to him. Arranging for delivery directly from a terminal could be difficult because 1) the distance from the terminal to the customer could be great enough that the delivery charges could be prohibitive and 2) the customer might not have enough storage to be able to receive a portion of a load from a transport, making direct delivery even more uneconomic.

The major oil companies are paying for installing vapor recovery only on the portions of bulk plants they own. Thus, all plant modifications will be made for a consignee, but the consignee will need to install vapor recovery for his own trucks. An independent jobber will have to assume all costs himself. This potentially could affect over 12,000 bulk plants throughout the country.

No surveyed operator feels he will be able to pass on the costs of vapor recovery to his customer. He has to remain competitive to keep his accounts, so he can't raise his prices. Even if every one in an area were affected and a price increase would be possible, the operators seem very unsure as to what they are able to do within the framework of the current price control programs and regulations.

5.5.2 Financial Information

Among the fiscal data requested were market value of the facility, original investment assets, annual sales, margins, profit, expenses and debts. Most operators were either reluctant to divulge all this information or they did not have it readily available.

The responses, summarized in Table 5.2, cover a very broad spectrum. The small sample size also limits the conclusions which can be made based on data obtained from the individual bulk plants.

Table 5.2 SUMMARY OF FINANCIAL DATA OBTAINED FROM INDIVIDUAL BULK PLANT OPERATORS

Sales			Margin		Costs/yr.	Profit/yr.	Net Worth
Million Liters/yr.	Million gal/yr.	$/yr.	¢/Liter	(¢/gal.)			
7.6	2	430,000	.90	3.4	$ 58,000*	$10,000	
1.4*	.4		.92	3.5			
15.1*	4		.79	3.0		0	
			.72	2.75		0	
7.6*	2		.95-1.5	3.6-5			<$100,000
5.3	1.4	700,000*	1.1	4.2	$105,000*	$22,400net	<$290,000
13.6*	3.6						
8.5*	2.2		1.3	4.8			
2.7*	.7	360,000*	1.3	.5		$14,400*	
15.1*	4	2,000,000	1.1	.4	$156,000*	4,000*	
22.7*	6	3,000,000	.26-.79	1-3	$180,000*	0	<$250,000
22.7	6	3,000,000	1.8 max	.7 max	$360,000	30,000	
6.9*	1.8						
6.4(x)	17	9,000,000	.99	3.75	$460,000	$769,000 gr	
(x)		2,300,000	1.3	5		$456,000 gr 32,000 net	$194,000
(x)		4,000,000				$160,000 net	$524,000
5.5*	1.4	500,000*	1.1	4			
5.6*	1.4	500,000*					
5.5*	1.4	500,000*	1.6-1.8	6-7	$ 70,000*		
5.5*	1.4	500,000*					
9.5*	2.5	900,000*	.79-.92	3-3.5			
4.1	1.5	720,000*	1.2	4.5	$108,000*	$ 21,600*	
18.9	5	2,250,000	1.3	5			
2.7*	.7*	350,000*	1.3	5-7.5			
8.2	3	1,500,000*				18% gross	
94.6	25.	12,000,000				1 1/2 ¢/gal gross	>$1,000,000
				2.5-3			
94.6	25. *	12,000,000		9%	$10,000,000	$ 90,000 net*	<$1,000,000

(x) Costs & Profits of selling other petroleum products may be included in data obtained.
* Calculated from other information given.

5.5.3 Additional Comments by Operators

Numerous operators are complaining about "spit back" when deliveries are made to customers with submerged fill tubes. "Spit back," which is spillage from the fill port while the tank is being filled, has been described as occurring, 1) continuously, 2) only in hot weather, 3) only when the fill pipe outlet is very close to the bottom, 4) only when the fill pipe diameter is rather small, 5) only during the last minutes of filling, or 6) only when shutting off the nozzle. Several accidents, ranging from the driver being splashed to a major fire, have resulted. Estimates of the amount spilled, the seriousness of the problem and methods used to minimize the problem are now being evaluated by at least one regulatory agency, the California Air Resources Board.

5.5.4 Classification of Bulk Plants

In order to perform the needed economic analysis, an attempt was made to determine a means of classifying similar bulk plants and of defining a typical operation based on these responses. In this section, the various schemes for classifying plants are described and the reasons for selecting or discarding a particular scheme is given.

a. Ownership of the Plant

A plant may be owned by a major oil company or a small businessman. The financial capability of the major oil company to install vapor recovery systems on its plants is not in doubt. The capability of the independent is. To use ownership as a basis for regulation is discriminatory; a major oil company cannot be required to install vapor recovery on one of its plants if an identical plant, independently owned, is exempt.

b. Gasoline throughput

The owner's financial ability--cash flow, profits, net assets--generally increases significantly with throughput, while the cost per gallon on vapor control equipment decreases.

Figure 2-1 presents a histogram of maximum daily gasoline throughputs for California and Colorado areas sampled. These data were primarily obtained by a telephone survey of owners or operators. Based upon these data, three gasoline throughputs will be assumed as typical for purposes of this analysis: 3,800 liters/day (1,000 gallons/day) is a small throughput, 15,140 liters/day (4,000 gallons/day) is an average throughput and 75,700 liters/day (20,000 gallons/day) is a large throughput.

The corresponding differences in equipment is primarily in the number of account delivery trucks. A typical small throughput plant will have one truck, an average throughput plant, two trucks, and a large plant, six trucks. Most of the other differences, such as changes in storage capacity plant size, and size of trucks, do not appear to be significant. It should be noted that the large plants tend to have newer equipment, which tends to lower cost for vapor recovery equipment. Also, they tend to have a smaller percentage of small agricultural customers.

c. Location

Some localities regulate the location or size of storage tanks or gasoline trucks. Boulder, Colorado, for example, limits the size of trucks within the city limits. Thus zoning and other restrictions, land values, railroad access, and customer location have tended to restrict bulk plants to areas outside of major metropolitan city limits.

d. The Type of Customer

Some plants claimed to have 100% agricultural accounts; others claimed 100% commercial accounts. However, the large proportion of survey respondents indicated that plants have a varying mixture of account types. Requiring vapor recovery on bulk plants serving any particular category of customers--agricultural, commercial, service stations, new tanks over 950 liters (250 gallons), agricultural tanks over 2,080 liters (550 gallons), or existing tanks over 7,570 liters (2,000 gallons)--would affect most bulk plants.

e. Type of Storage

Plants with underground storage tended to be more modern than above ground facilities. Connecting a coaxial type gasoline delivery and vapor return fitting (to recover vapors during incoming load transfer) to a mating adaptor and drop tube (such as Emco-Wheaton P/N 298) is generally significantly less costly on below ground tanks when compared to typical above ground installations. However, if an underground tank is old, has an inadequate port size, leaks, and is deeply buried under concrete in difficult terrain, costs may dictate abandonment of the tank. Thus, even though average costs for installing vapor recovery are lower for underground tanks than above ground, the range of costs and the maximum costs that the majority of operators would be required to expend is generally similar. Also, it would be discriminatory to enforce separate control regulations for underground tanks and for above ground tanks.

f. Assets or Property Values

The larger operators tend to have greater assets and property values and better financial capabilities. However, there is a wide range of assets for small and large operators and they do overlap significantly. As stated earlier, the facilities--area and equipment--required to operate a bulk plant do not vary much with

throughput; storage is required for each grade of gasoline and a loading rack is necessary, so that only the number of trucks will vary.

g. Storage Capacity

The larger operator tends to have a larger storage capacity, but again the range of numbers is too wide to provide a useful classification.

5.5.5 Number of Delivery Trucks

Larger operations generally have more trucks, up to eight among surveyed plants, but this still does not appear to be a judicious way of indicating a plant's economic status, due to overlap and ease of changing the indicator, such as taking trucks out of service, or using larger capacity trucks.

6. MARKET ANALYSIS OF BULK PLANTS

Bulk plants operate in market environments that vary in competition due to the make up of their respective customer sets. These markets range from being virtually monopolistic to being highly competitive. Consequently, a bulk plant operator must react in a manner that is sensitive to his environment while considering the range of alternatives available to his customers.

Both bulk plant operators and their customers are prepared to modify their actions to take advantage of changing market conditions. The operators will seek to raise prices and curtail services in order to maintain or increase profit margins. On the other hand, their customers will seek to obtain special services and lower prices for gasoline. The degree of existing competition will be the major determinant in resolving this conflict.

A principal aspect of the bulk plant business that appears to be self-evident is that the field lacks consistency. As implied previously, there are several owner/operator situations within the industry. Additionally, competition is increasing from other methods of marketing gasoline. These methods include direct dealers and pipeline facilities.

For any particular operator, there are relevant factors that affect his business and have a major influence on its conduct. These factors will certainly include the following:

- Relationship with his supplier
- Efficiency of his plant
- Size of his customers
- Distance traveled to his customers
- Extent of direct competition
- Governmental regulations

These factors will affect both his gross profits and net profits. For example, if the operator's customers are relatively distant his delivery costs will be high. If he has many small customers, costs per delivery will be higher than if he had a few large customers.

Bulk plant suppliers may not sell gasoline to all of their customers at the same price. According to industry practice, an operator will be able to purchase product from his supplier at a lower price if he incurs higher than normal expenses in servicing his customers. In a sense, the operator is being subsidized by his supplier in order to sell gasoline to a particular group of customers at a given price.

During this study, the question has been raised of independent operators receiving subsidies for other situations beyond their control, such as the installation of vapor recovery equipment. The almost universal response from both operators and suppliers was that a lump sum type of assistance could not be expected.

The operators seem to be left with three possible alternatives: 1) either absorb the added costs, 2) seek lower supply prices, or 3) raise delivery prices. An increase in the price of gasoline raises the further question of an accompanying decrease in demand and the possible substitutions available to consumers seeking to purchase gasoline at lower prices.

Economically, direct supply is viable only for individual customers located relatively short distances from refineries. If long distances must be traveled for any deliveries, costs will begin to escalate rapidly for individual small users. Large users, those with at least 30,000 liter (8,000 gallon) tanks, are likely to deal with direct bulk sellers or hire trucks to provide deliveries from the refinery to his facility, bypassing the bulk plant.

7. FINANCIAL ANALYSIS

7.1 FINANCIAL DATA AND STATISTICS

Determining the financial structure and capability of typical bulk plants is a very difficult matter. Many of these firms are in businesses other than just the wholesale marketing of gasoline. They sometimes own gasoline stations and sell tires, batteries and accessories (TBA) in addition to gasoline and other petroleum products. It is also quite difficult to define what one means by typical in terms of location, customer set, sales volume, additional lines of business, profitability and asset value.

Many firms, both large and small are reluctant to freely disperse their annual financial data. Nevertheless, sources for this information are available through Dun and Bradstreet and Robert Morris Associates (RMA). The former provides banks, insurance companies and other institutions with financial data, corporate histories and ratings for numerous companies. PES has obtained several of these reports for firms in the bulk plant business.

Robert Morris Associates is a service that publishes summary data for groups of companies within most Standard Industrial Classification (SIC) codes. For the bulk plant industry, SIC code 5171 was selected which is defined as follows:

> "Establishments primarily engaged in wholesaling petroleum products, including liquified petroleum gas, from bulk liquid storage facilities." *

RMA has collected financial data for 151 firms within this classification. As indicated above, the companies included in this listing are often in other related businesses in addition to the operation of bulk plants. RMA has published data for companies grouped according to their asset value. The groups consists of 18 companies with assets under $250,000, sixty-seven companies with assets of between $250,000 and $1,000,000, and fifty-nine firms with assets of between $1,000,000 and $10,000,000. In addition, significant ratios by statistical quartile have been computed for the companies within each asset grouping. These statistics are presented in Tables 7.1 and 7.2.

The ratios calculated in Table 7.2 are defined in Table 7.3. These ratios are commonly used to assess the financial capability and health of firms as compared to other organizations in the same industry.

Three numbers are depicted for each ratio in Table 7.2. These values represent the quartile points in each case. For example, if a group had 19 members, then the quartile points would define the values of the fifth, tenth and fifteenth members. It is clear from this discussion that management of any company in a given industry will attempt to keep their ratios away from the lowest quartile of any group as this might tend to indicate weakness. By having this type of data, management is able to measure its performance against others in the same industry.

* Robert Morris Associates - Statement Studies, 1975

Table 7.1 BALANCE SHEET AND INCOME STATEMENT FACTORS FOR WHOLESALERS OF PETROLEUM PRODUCTS

	WHOLESALERS OF - PETROLEUM PRODUCTS 77 STATEMENTS ENDED ON OR ABOUT JUNE 30, 1974 76 STATEMENTS ENDED ON OR ABOUT DECEMBER 31, 1974			
ASSET SIZE	Under $250K	$250K & Less Than $1MM	$1MM & Less Than $10MM	All Sizes
NUMBER OF STATEMENTS	13	67	69	153
	%	%	%	%
ASSETS				
Cash	10.4	10.8	14.1	9.7
Marketable Securities	.0	1.7	.5	1.7
Receivables Net	27.6	27.7	23.6	24.4
Inventory Net	25.0	17.3	19.0	18.3
All Other Current	1.8	1.8	1.8	1.2
Total Current	64.8	59.4	59.0	55.4
Fixed Assets Net	28.5	33.2	34.4	38.4
All Other Non-Current	6.7	7.5	6.6	6.2
Total	100.0	100.00	100.0	100.0
LIABILITIES				
Due to Banks-Short term	3.2	4.9	3.8	3.9
Due to Trade	16.6	20.0	23.0	22.3
Income Taxes	2.6	4.5	5.6	4.0
Current Maturities LT Debt	4.1	4.7	3.6	3.7
All Other Current	19.7	8.0	10.1	8.4
Total Current Debt	48.3	42.1	46.2	42.2
Non-Current Debt, Unsub.	10.4	17.7	16.5	18.1
Total Unsubordinated Debt	58.8	59.8	62.7	60.3
Subordinated Debt	.0	.6	.4	.3
Tangible Net Worth	41.2	39.4	36.8	39.4
Total	100.0	100.0	100.0	100.0
INCOME DATA				
Net Sales	100.0	100.0	100.0	100.0
Cost of Sales	82.6	81.9	84.5	78.4
Gross Profit	17.4	18.1	15.5	21.6
All Other Expense Net	13.9	14.8	10.6	14.8
Profit Before Taxes	3.5	3.3	4.8	6.8

Table 7.2 RATIO ANALYSIS FOR WHOLESALERS OF PETROLEUM PRODUCTS

Based on 153 statements ending during calendar year 1974

Asset Size / RATIOS	Under $250M 18	$250 and less than $1MM 67	$1MM and less than $10MM 59	All Sizes 153
RATIOS	1.0	1.2	1.2	1.2
Quick	.8	.9	.9	.9
	.5	.7	.6	.6
Current	1.7	1.8	2.0	1.8
	1.5	1.4	1.3	1.4
	1.1	1.0	1.0	1.0
Fixed/ Worth	.3	.4	.5	.5
	.7	.8	.9	.8
	1.0	1.4	2.0	1.6
Debt/ Worth	.7	.8	.9	.8
	1.3	1.5	1.6	1.6
	2.7	2.9	3.3	3.1
% Profit	85.8	60.3	60.3	60.7
Bef. Taxes/	28.5	35.2	33.3	35.2
Worth	6.6	19.3	23.0	20.3
% Profit	25.5	18.4	18.4	19.2
Bef. Taxes/	16.4	11.4	12.9	12.9
Tot. Assets	3.0	7.0	7.4	7.2

The three values in each box represent the quartile points for each ratio and asset size.

Table 7.3 DEFINITION OF RATIOS

QUICK RATIO

Method of Computation: The total of cash, short-term marketable securities and net receivables for the industry composite was divided by the total of current liabilities.

Result: The ratio measures short-term liquidity available to meet current debt.

Principle: Also known as the "acid test" or "liquidity" ratio, it is of particular benefit to short-term creditors, as it expresses the extent to which cash and those assets most readily convertible into cash can meet the demands of current liabilities. Any value of less than 1 to 1 implies a reciprocal "dependency" on inventory or other current assets to liquidate short term debts.

CURRENT RATIO

Method of Computation: The total of current assets for the industry composite was divided by the total of current liabilities.

Result: The ratio is one measure of the ability of the industry to meet its current debt.

Principle: In comparing an individual company to the industry, a higher current ratio indicates that more current assets are free from debt claims of creditors and prompter payment can be expected.

FIXED/WORTH

Method of Computation: The net fixed assets (plant & equipment less reserve for depreciation) for the industry was divided by the tangible net worth.

Table 7.3 Definition of Ratios con't.

Result: The ratio expresses the proportion between investment in capital assets (plant and equipment) and the owners' capital.

Principle: The higher the ratio, the less owners' capital is available for working capital. The lower this ratio, the more liquid is the net worth and the more effective owners' capital is as a liquidating protection to creditors. The presence of substantial leased fixed assets--off the balance sheet--may deceptively lower the ratio.

DEBT/WORTH

Method of Computation: The total debt for the industry composite was divided by the tangible net worth.

Result: The ratio expresses the relationship between capital contributed by creditors to owners' capital--"what is owed to what is owned."

Principle: Total assets or resources represent the entire capital at the disposal of a given company and consist of net worth or owners' capital, and creditor capital--that provided by those outside the business for temporary use. The proportion existing between debt and worth--or leverage--records the debt pressure. The lower the ratio, the easier the pressure and the greater the protection for creditors.

PROFITS BEFORE TAXES/WORTH

Method of Computation: The amount of net profit before taxes was divided by the tangible net worth.

Table 7.3 Definition of Ratios con't.

Result: The ratio expresses the relationship between the owners' share of operations before taxes for the year and the capital already contributed by the owners.

Principle: Capital is usually invested in a company in the anticipation of a return on that investment--in the form of a profit. This hope of a profit is the attraction for original and new capital. The higher the profit before taxes to worth, the greater is the probability of making appreciable addition to owners' capital after payment of dividends and taxes.

PROFITS BEFORE TAXES/TOTAL ASSETS

Method of Computation: The amount of net profit before taxes of the industry were divided by the total assets for the industry.

Result: The ratio expresses the owners' share of the year's operations before taxes related to the resources contributed by both owners and creditors.

Principle: The relationship indicates the net profitability of the use of all resources of the business.

7.0 FINANCIAL STATEMENT SUMMARY

Each industry tends to exhibit different types of financial statements. For example, the firms in one industry may have a large percentage of fixed assets while another industry may show more current assets. On the liability side as well, firms within an industry will show similarities and will tend to differ in the degree of various elements. Consequently, it is extremely difficult to compare firms in various industries. The common practice is to assess how any given firm in an industry compares to the averages and standards developed for that industry.

By reviewing the data for the balance sheets and income statements given in Table 7.1, some general statements can be made about the data summarized for the industry. Most of the data shown is representative of firms with at least $250,000 in assets. The smaller companies have a greater percentage of current assets than the larger firms with differences appearing primarily in a higher percentage of fixed assets in inventories and a low percentage of assets. On the liability side of the balance sheet, a reasonably large disparity between the smaller and bigger firms is apparent in the percentage of non-current debt. This fact reflects the greater difficulty in most industries of small firms to obtain long term debt.

One further point should be made regarding financial data on balance sheets. According to generally accepted accounting principles, fixed assets always reflect historical cost rather than their current market values. Therefore, the balance sheet of a company may not truly reflect the actual financial capability of the firm. For example, a small bulk plant may have been purchased thirty years ago and the recorded land value will reflect its actual cost at that time. In the intervening period, the market value of the land may have increased substantially but the firm's

balance sheet and accounting records will continue to carry this asset at its original cost.

7.3 INVESTMENT IN VAPOR RECOVERY SYSTEMS

The approach to be taken in the following discussion will be to assess the impact of several expenditure levels for vapor recovery equipment on firms of various asset values and sales. As can be expected, within each group of companies, an irregular ability to accept costs of a given amount will be exhibited. The PES approach will be to evaluate the impact of varying expenditures on average firms of several sizes (as represented by data in Table 5.1) and assess the new quartile position of this firm (as represented by the data in Table 5.2). If any expenditure causes the firm to show drastic and unfavorable changes in particular ratios, it can be concluded that the expenditure will have an adverse effect on the enterprise. This is due to the fact that such changes indicate the probable existence of strains on the financial capabilities of the firm in such areas as availability of capital, profitability and borrowing potential.

The analysis described below will concentrate on firms with assets of between $50,000 and $750,000, and will be concerned principally with the debt structure, working capital position and profitability of an enterprise. These firms can be expected to require an investment of between $30,000 and $150,000 for installation of a vapor balance and bottom loading capability at plant sites and for modification of their delivery and, in some instances, their supply trucks.

7.4 SOURCES OF CAPITAL

Most companies in the asset range being considered will be unable to raise the needed capital internally and will have to

seek outside sources of funds. The most likely organizations available to provide this assistance will be banks. Other assistance may be expected from the Small Business Administration (SBA) and the Pollution Control Financing Authority (PCFA) in most states. The latter have been organized to provide low interest loans to industry in order to purchase and install pollution control equipment. However, only in the State of California has this organization been specifically attempting to assist small businesses.

On June 4, 1976 President Ford signed Senate Bill 2498 into law (Public Law 94305) which provides the SBA with the capability to guarantee contracts that the California PCFA has with businesses including loan agreements. These contracts are then used as security to sell tax exempt bonds primarily to banks who make loans to firms needing to install pollution control equipment at reduced rates. If this program proves successful, it will probably be expanded to other sections of the country.

When a potential borrower seeks a loan, he must demonstrate to his bank that he possesses the capacity to repay the principal and interest in a reasonable time period. If he cannot demonstrate this fact, neither the SBA nor the PCFA can grant him a loan. His credit worthiness is determined solely by his bank.

In most usual circumstances, banks will make equipment loans for a period of three to five years at the prevailing rate of interest. This rate is presently about 11%, however, it is subject to change depending on the size of the loan, the type of equipment and the credit worthiness of the borrower. If the loan applicant qualifies under SBA or PCFA criteria, he could obtain a loan for eight or more years at an interest rate that is three or four percent below the prevailing rate.

Recently, the SBA has also recognized the special hardships that can be created for small businesses in meeting air pollution

regulations. Accordingly, a program of air pollution control loans has been instituted. Further information pertaining to this program, as well as California's PCFA loans is contained in Appendix E.

7.5 ANALYSES OF FINANCIAL CAPABILITY

In order to assess the financial capability of typical small firms in the industry, seven pro-forma balance sheets and income statements have been created for enterprises with selected levels of assets and sales. These statements, as shown in Table 7.4 represent companies with assets ranging from $50,000 to $750,000 and with total annual sales between $150,000 and $2,500,000. These statements were developed from the data provided in Tables 7.1 and 7.2.

From these data, ratios for total debt/net worth of the seven typical companies have been generated assuming different levels of vapor recovery expenditures. These new ratios are shown in Table 7.5 for two cases. In the first case the loan is made for 80% of the designated amount - a 20% down payment being required. The second case shows 100% financing available, because of guarantees by the SBA or the California PCFA. When the debt/net worth ratio reaches the 2.5 area, it indicates that the firm is maintaining a high proportion of debt. At this point creditors of this company will begin to become concerned about its credit worthiness. Any additional borrowing will become extremely difficult unless the debt/net worth ratio can be reduced. For this reason a ratio of 2.2 will be considered as a desirable maximum.

Working capital must also be considered in order to assess the capability of an enterprise to make a down payment, if necessary, and continue in operation while paying off the loan. Quite clearly, all working capital cannot be diverted to loan purposes. For this exercise let us assume that 50% of working capital can be diverted.

[redacted]

Table 7.5 [illegible]

[illegible] Loans @ 80% of Expenditure (20% Down Payment)

EXPENDITURE \ ASSETS	$50K	$100K	$150K	$200K	$300K	$500K	$750K	Down Payment
$0	1.3	1.3	1.3	1.3	1.5	1.5	1.5	
30K	2.6	2.0	1.3	1.7	1.7	1.7	1.6	$6K
50K	3.4	2.4	2.1	1.9	1.9	1.7	1.7	$10K
75K		2.9	2.4	2.2	2.0	1.8	1.7	$15K
100K		3.4	2.7	2.4	2.2	1.9	1.8	$20K
125K			3.0	2.6	2.4	2.0	1.9	$25K
150K				2.9	2.6	2.1	1.9	$30K

[illegible] Loans @ 100% of Expenditure

EXPENDITURE \ ASSETS	$50K	$100K	$150K	$200K	$300K	$500K	$750K
$0	1.3	1.3	1.3	1.3	1.5	1.5	1.5
30K	2.9	2.2	1.9	1.8	1.8	1.7	1.6
50K	3.9	2.6	2.3	2.0	2.0	1.8	1.7
75K		3.3	2.6	2.3	2.2	1.9	1.8
100K		3.9	3.1	2.6	2.4	2.0	1.9
125K			3.4	2.9	2.6	2.2	2.0
150K				3.3	2.8	2.3	2.0

Many organizations are likely to find this amount too high and could result in causing them cash flow difficulties. Nevertheless, 50% appears to be a reasonable jumping off point.

With this factor in mind, one can estimate the maximum loan a firm can undertake based solely on working capital from banks or through the SBA or PCFA for the seven typical companies as follows:

Asset Size	50% of Working Capital	Maximum Bank Loan	Maximum SBA or PCFA Loan
$ 50,000	$ 4,125	$ 0	$ 0
100,000	8,250	0	50,000
150,000	13,375	30,000	75,000
200,000	16,500	35,000	100,000
300,000	25,950	60,000	150,000
500,000	43,250	100,000	150,000
750,000	64,875	150,000	150,000

Since a minimum of $30,000 is required for installation of bottom loading capability and vapor recovery for incoming and outgoing loads, any acceptable loan below this amount is shown as zero. Additionally, SBA and PCFA loans of larger amounts can be supported since they may not require down payments, and are to be repayed over longer time periods at lower interest rates.

Finally, profitability must be considered since the enterprise must generate the earnings to replenish working capital and make loan payments. Realistically, no lender will be confident in making a loan unless principal and interest payments are covered by the potential earnings of the enterprise. Accordingly, the firm's net income will determine the amount of loan that may be granted.

Under usual circumstances, an investment in plant and equipment is made in order to replace worn out facilities, modernize

the establishment, or improve operating efficiencies. The result of this type of investment is reasonably expected to be increased profitability. It is these higher profits that are then used to repay the principal and interest of any loan undertaken for the purpose of making this investment. In the case of vapor recovery, this scenario cannot be expected. Rather, any debt incurred for the purpose of meeting vapor recovery regulations will have to be honored from non-rising profits.

The profits of any business are used to provide a return to its owners and for reinvestment in the business. Consequently, it is unreasonable to expect that all of the profits of the business should be employed for vapor recovery purposes. Every company must constantly reinvest in its plant and equipment in order to maintain adequate operations.

Again, let us assume that no more than 50% of after tax profits can be utilized for loan repayment. This procedure provides for a minimum level of profits to be used for purposes unrelated to the vapor recovery installation.

Given this background, the maximum loans that can be expected for the seven typical companies are as follows:

Asset Size	50% of After Tax Profits	Bank Loan	SBA or PCFA Loan
$ 50,000	$ 2,000	$ 0	$ 0
100,000	4,000	0	0
150,000	6,800	30,000	35,000
200,000	9,500	45,000	60,000
300,000	12,750	60,000	75,000
500,000	20,000	90,000	120,000
750,000	28,000	125,000	150,000

These estimates have been based solely on the amount that can be repaid from previous year's profits and do not include the effect of any special tax incentives.

Tax incentives may have a significant impact for many companies contemplating a vapor recovery investment. In this connection, the Internal Revenue Code includes special provisions for firms, and especially small businesses purchasing and installing certified pollution control facilities. In addition to all interest payments being deductible expenses for tax purposes, Section 169 of the code permits a rapid write-off of such certified investments. Under this regulation a company may choose to depreciate its newly acquired facility over a sixty-month period instead of over its useful life. Employing the straight-line depreciation method, 20% of the cost of this investment could be deductible for five years.

Sections 46 and 50 of the code deal with the subject of investment tax credits. Under the 1975 provision, all businesses may credit 10% of the cost of equipment with a depreciable life of at least seven years to their actual tax liability. Lesser percentages may be created for equipment depreciated over a minimum period of three years to a maximum of six years. The purpose of this regulation is to provide businesses with added incentives to purchase equipment.

Finally, Sections 179 of the code furnishes small business with an additional opportunity to reduce their taxes. It permits an added first year bonus depreciation allowance equal to 20% of the purchase price of the equipment.

Accordingly, a small business will be able to deduct its interest expense plus almost 50% of the purchase and installation price of certified pollution control equipment, depending on the depreciation method used. Other businesses will be able to deduct 30% plus interest charges.

The primary benefit resulting from these incentives will be a reduction in the tax burden on the affected companies. Consequently, firms with little or no profits will accrue only minor assistance from these regulations. For firms enjoying profits, they will benefit from sharply reduced tax expenses and an increased cash flow. The latter will provide additional security to financial institutions contemplating loans to the firm and may result in the business being able to spend larger sums on pollution control equipment.

7.6 DETERMINATION OF LOAN LIMITS

In order to be eligible for a loan, a company must be able to demonstrate that its financial structure is able to absorb additional borrowing, that it possesses the working capital to make the required down payment and pay the associated fees, and that it has the earnings capacity to maintain its financial capability and retire the loan. These aspects have been considered above for our typical companies in relation to various size loans. We can now combine the results above and determine approximately the maximum amount each size firm can be expected to borrow.

This estimate has been calculated by computing the minimum acceptable loan amount for each size company and then choosing the smallest amount in each group. The data resulting from this procedure are shown in Table 7.6. The amount that can be borrowed for each asset group is then equal to the smallest value in that group as follows:

Asset Size	Net Sales Dollars	80% Bank Loan	100% SBA or PCFA Loan
$ 50,000	$ 150,000	$ 0	$ 0
100,000	300,000	0	0
150,000	500,000	30,000	35,000
200,000	700,000	35,000	60,000
300,000	1,100,000	60,000	75,000
500,000	1,600,000	90,000	120,000
750,000	2,500,000	125,000	150,000

It should be reemphasized that these amounts reflect estimated maximum investments for the typical firms based on the specified assumptions. These assumptions are believed to reasonably reflect the real world situation, but they are susceptible to reinterpretations.

8.0 GLOSSARY

- Account Trucks - Tank trucks used to deliver gasoline to the customer.
- Commission Agent - An operator of a bulk plant owned by a major oil company.
- Independent Jobber - An owner and operator of a bulk plant(s).
- Keylock Systems - Self-service pump(s) at bulk plant.
- Major Oil Company - An integrated company which produces, refines, and markets petroleum products.
- Submerged Fill or Drop Tube - Delivery nozzle or pipe with discharge opening no more than 6 inches above the tank bottom.
- Truck-Trailer Transport - Bulk road transportation for the delivery of gasoline from refineries and terminals.

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2) Telephone conversation with Dr. Doyle Reed, University of California at Davis, Agricultural Extension Service and Cliff Dickason, United States Dept. of Agriculture, Natural Resources Economics Division.

3) NIOSH Health and Safety Guide for Bulk Petroleum Plants, Pub. No. 75-112, U.S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health Division of Technical Services, Cincinnati, Ohio.

4) Telephone conversation with Ms. Tracy Kirkham, attorney involved with a suit brought by bulk plant operators against Arco., Inc. to prevent closure of bulk plants by ARCO. Follow up from article in the Los Angeles Times, July 2, 1976.

5) Telephone conversations with Messrs. Maple & Coldwell with Regulations Development in FEA, Washington, D.C.

6) "Price Making and Price Behavior in the Petroleum Industry" by Ralph Cassady, Jr., Yale University Press, New Haven, 1954.

7) "Gasoline Prices and Competition" by Harold M. Fleming, Meredith Publishing Co., New York, 1966.

8) National Petroleum News Fact Book Issue, McGraw-Hill, Inc. Mid-May, 1975.

9) National Fire Protection Association, Flammable and Combustible Liquids Code, NFPA No. 30, Chapter VI, Article 62, Section 6240, Paragraph 6244.

10) Telephone conversation with Mr. Marc Hitchins, Arco, Inc., Chicago, Illinois, Property Disposal

11) "Bulk Plant Operation and Delivery of Products", API Accident Prevention Manual No. 8, First Edition, March, 1935.

12) "Assessing the Impacts of Oil Industry Divestiture on Gasoline Jobbers and Fuel Oil Distributors and the Customers They Serve", Prepared for National Oil Jobbers Council, 1750 New York Avenue, N.W., Suite 230, Washington, D.C. 20006, Prepared by Resource Planning Associates, Inc., 44 Brattle Street, Cambridge, Massachusetts 02138, April 29, 1976.

APPENDIX A
QUESTIONNAIRES

QUESTIONNAIRE

1. OWNER/OPERATOR _____ Phone _____

   ADDRESS _____ CONTACT _____
   (If other than owner)

   _____

2. Installation costs and/or Estimates of initial equipment cost of plant vapor recovery system. Type_____, Plant Cost _____, Truck Cost_____

   Installed by or estimated by _____

3. Other costs or estimated costs of vapor recovery. % added

   time at plant _____,

   % Added time at Delivery _____, Name of Tax Assessor _____

   % Raise in property taxes _____, Name of agent or insurance co. _____

   % Raise in insurance _____, % Added Maintenance Cost_____

   Total monthly Operating Cost $_____ and percentage increase due to incoming V.R._____, and outgoing V.R._____

4. What is reasonable cost of vapor recovery equipment? _____ Why?_____

5. Assume vapor recovery will initially cost $20,000 ($10,000 for facility and $10,000 for trucks) and operating costs (extra time, taxes, insurance, etc) will increase 20%

   - Could you stay in business? _____

     Why (not) _____

   - Could you obtain $20,000 loan? _____, Why(not) _____

     Name of bank _____

     What interest rate would you pay?_____

- Repeat for $10,000 or $30,000 initial cost operating cost and increase of 10%

6. If you are forced out of business what would you do? _____

   What would your customers do? _____

7. Do you think your gasoline supplier would absorb some or all of vapor recovery costs? _____ why(not) _____

   Who, in oil company, do you negotiate with _____?

   Would compensation be a lump sum (amount _____)
   or an increase in margin (amount _____, pay back period _____)

8. Do you think your customers would absorb some or all of vapor recovery costs? _____why(not)?_____

   Name of typical customer, willing to discuss? _____

   Amount of price increase 95% of your customers would tolerate? _____

   Amount 50% would tolerate? _____

   Would displaced customers get gas themselves _____ or get deliveries direct from termipal _____

9. What could you sell your trucks, facility, accounts receivable and good will for? $_____

   What did you originally invest?_____

   What is your nresent margin?_____

   What are the annual sales/year in $_____

   in gallons_____

Gross profit } amount or rate _____
Net profit }

Is operator in debt?_____ How much?_____

What is debt/equity or debt total assets ratio?_____

Also, rate of return on total assets or net worth_____

10. What is price difference in direct terminal delivery and bulk plant delivery of gasoline? _____

11. What is your break even point _____

12. How many bulk plants in 25 mile radius?_____ what % would go out of business if $20,000 initial investment was required?_____ $10,000?_____, $5,000 _____

Would terminal delivery _____ or other bulk plants _____ at customers _____pick up accounts?

13. Is there any other impact of vapor recovery regulations other than financial, safety? _____

Energy consumption? _____

Employment? _____

MAJOR OIL CO QUESTIONNAIRE

1. NAME OF CO. _____ PHONE _____
   ADDRESS _____ CONTACT NAME _____
   _____ TITLE _____

2. What is total number of bulk plants your company owns? _____
   _____(approximately)

   What is typical gasoline throughput?_____

   What is (additional) number of bulk plants your Co.
   supplies? _____(approximately)

   Do you plan to continue bulk plant operations? _____why_____

   What is present cost (dis) advantage to deliver direct or thru bulk
   plant?_____

3. What are typical and range of costs for initial plant vapor
   recovery? _____(System type _____)

   What factors influence costs _____

   What is name of typical contractor used _____, or
   dept. head responsible _____

4. What are typical and rang. of costs for initial truck vapor
   recovery? _____(type)_____

   Cost range factors _____

4 (continued)

Name of typical contractor _____or dept. head _____

5. What are other expected or estimated costs?_____% added operating time_____% added maintenance_____, % added training_____, % added insurance_____, % added property taxes_____ % overall increase in total operating cost due in incoming V.R._____ outgoing V.R._____
Total typical (daily) operating costs_____
offsetting gain in gasoline not lost_____

6. What is reasonable cost of vapor recovery?_____

7. Hypothetical question. If required vapor recovery system would have an initial cost of $10,000 (plant only) and require operator of delivery trucks to spend an additional $10,000 plus a 30% increase in other costs (time, maintenance, etc.)

Estimate how many bulk plants your co. would close?_____why?_____
Estimate how many bulk plants you supply would close?_____why?_____
Repeat questions for 1/2 or double all costs, depending on answer.

8. What would depreciation time be for V.R. equipment and installation _____Yrs.

9. What % of total costs would your company bear for your owned plants _____
%operators _____% customers _____(amount of price increase _____)

10. What % of total costs would your company bear for additional independant bulk plants you supply _____ % operators _____ % customers _____

11. Would your company's support be in the form of increased margin _____¢, lump sum payment _____, or other (i.e. increased sales, picking up credit or other costs) _____

12. What is typical worth of a bulk plant?_____Based on _____ % facilities and equipment _____, % goodwill _____ have you sold any plants recently?_____ price _____ broker or company contact _____

13. What is typical break even operating cost for a bulk plant?_____ Based on _____ including what assumptions? (no. of employees, utilities, etc.)

14. If bulk plant operators are forced out of gasoline business, what in your opinion, would operators do? _____ why _____
% direct gasoline supplier _____
% continue without sales of gasoline _____
% sell gasoline retail (buylock) _____
% other petroleum industry activity _____
% Retire _____

- What would net gain or loss in jobs be _____
- What would customers do? _____ why_____

  % get direct delivery _____(assuming what change in cost _____)

  % Pick up their own gasoline in bulk _____

  % getting their own gasoline retail _____(assume what Δcost _____)

  % switching to diesel _____

  % other _____(specify)

15. What price increase would 95% of customers tolerate? _____

    50% _____

16. What distribution of bulk plants (no. in 35 mile radius) do you foresee in future? _____ why_____

17. Any other bulk plant financial data

    - typical margin
    - profit rate (gross & net)
    - debt structure (debt/equity)
    - return on investment
    - taxes paid
    - sales/year
    - total assets

18. What are the importance of the following factors in deciding whether to install V.R. at a specific plant?

	Large	Influence Med.	Small
gasoline throughput			
proximity of other bulk plants (specify)			
proximity of terminals (specify)			
age of facility			
rural vs city location			
spill prevention status			

18. (continued)

	Influence		
	Large	Med.	Small
Local political situation			
State political situation			
National political situation			
Anti trust considerations			
FEA allocations			
FEA emergency storage plans			
Other FEA regulations			
Satisfied customers			
Operator's capability (specify)			
OSHA regulations (specify)			
Corporate image			

APPENDIX B
LIST OF CONTACTS

The following is a list of agencies, associations and firms contacted:

1. Air Pollution Control Agencies

   D. Andrew, Maryland State Bureau of Air Quality and Noise Control, Baltimore, Md.

   F. Venturini, California Air Resources Board, Sacramento, Ca.

   Mr. Gardner, New York State Department of Environmental Conservation, Albany, N.Y.

   J. Richter, Department of Environmental Protection, Hartford, Ct.

   L. Gerry, New Jersey Bureau of Air Pollution Control, Trenton, N.J.

   J. Hanzlo, Missouri Department of Natural Resources, Jefferson City, Mo.

   R. Nishimura Orange County Air Pollution Control District, Santa Ana, Ca.

   P. Roberts, Texas Air Control Board, Austin, Tx.

   Mr. Talbert, Bay Area Air Pollution Control District, San Francisco, Ca.

   _____, Department of Environmental Resources, Commonwealth of Pennsylvania, Harrisburg, Pa.

   _____, Indianapolis Department of Public Works, Indianapolis, In.

   _____, Bureau of Air Quality Control, Boston, Ma.

2. Industry associations

   F. Bertotta, Jr., Pacific Oil Conference, So. San Francisco, Ca.

R. Gavin, Society of Independent Gasoline Marketers of America, St. Louis, Mo.

G. Houton, National Oil Jobbers Council, Washington, D.C.

F. Maeda, Empire State Petroleum Assn., Inc., New York, N.Y.

E. Peeler, Texas Oil Marketers Assn., Midland, Tx.

D. Schroeder, Maryland Petroleum Assn., Annapolis, Md.

D. Southern, American Petroleum Institute, Washington, D.C.

J. Zinkand, Pennsylvania Petroleum Assn., Inc., Harrisburg, Pa.

3. Major Oil Company Representatives

W. Burnard, Jr., Standard Oil Company of California, Sacramento, Ca.

C. Bowers, AMOCO, Inc., Kansas City, Kansas

E. Brown, Texaco, Inc., Los Angeles, Ca.

I. Cameron, Phillips Petroleum Company, San Mateo, Ca.

G. Cloughlin and S. Dahlheim, ARCO, Inc., Chicago, Ill.

G. Dietz, Standard Oil Company of California, Long Beach, Ca.

Q. Eisle, Exxon Company, U.S.A., Los Angeles, Ca.

E. Grundy, Gulf Oil, Houston, Texas

Mr. Hopper, ARCO, Inc., Los Angeles, Ca.

W. Littlebridge, AMOCO, Inc., Denver, Co.

D. McKeague, Union Oil Company of California, Los Angeles, Ca.

W. Milne, Conoco, Inc., Denver, Co.

J. St. Germain, AMOCO, Inc., Baltimore, Md.

R. Stoddard, Shell Oil, Houston, Texas

Mr. Warwick, ARCO, Inc., Los Angeles, Ca.

R. Wilson, Indiana Farm Bureau Cooperative Association, Incianapolis, Inc.

4. Bulk Plant Operators

R. Ballow, Beacon-Ballow, Reedly, Ca.

Mr Barrington, Union Oil, Los Banos, Ca.

F. Bertetta, Jr., Olympia Oil Co., So. San Francisco, Ca.

J. Callori, Callori Oil, San Leandro, Ca.

Mr. Gifford, Gifford Oil, Lindsay, Ca.

R. Graves, Orange Belt & Supply, Lindsay, Ca. and Woodlake, Ca.

Mr. Greene, Greene Bros., Brighton, Co.

I. Harness, Harness and Sons, Dinuba, Ca.
Mr. Hohenseelt, Red Triangle, Fresno, Ca.
G. Kahm, Kahm Oil, Pittsburgh, Pa.
R. Kuhl, Salinas Valley Oil Co., Santa Rosa, Ca.
S. Kroesche, Inland Oil, Escondido, Ca.
J. Laughton, Texaco, Merced, Ca.
D. Looman, Shell Oil, Ventura, Ca.
D. Martin, Martin Oil, Fresno, Ca.
Mr. McCoy, Currie Bros Oil, Fresno, Ca.
D. Murray, Murray Petroleum Co., Bakersfield
R. Perkes, Furman, Lindsay, Ca.
P. Petersen, ARCO., Inc., Wasco, Ca.
Mr. Porter, Porter Oil, Beaumont, Texas
C. Purcell, Shell Oil, Pasadena, Texas
R. Pettit, Navy Oil Co., Bakersfield, Ca.
Mr. Quinn, Mobil Oil, Tulare, Ca.
F. Reese, Marion County Farm Bureau, Indianapolis, Ind.
S. Rohrers, Anaheim, Ca.
D. Rose, Visalia, Ca.
F. Ross, J. Griggs, Exeter, Ca.
Mr. Salas, Salas Oil, Denver, Co.
L. Sawyer, Shell Oil, Van Nuys, Ca.
F. Schwartz, Schwartz Oil, Valencia, Ca.
Mr. Seale, Union Oil, Merced, Ca.
R. Shuster, Shuster Oil and Chemical, Escondido, Ca.
J. Silveira, Fresno, Ca.
E. Tait, E.D. Tait Petrol Distr., Pixley, Ca.
G. Weiss, Union Oil, Turlock, Ca.
Flint Tex Oil, Columbus, Texas
Pocahontas, Inc., Salisbury, Maryland
Siebert Oil, Fresno, Ca.

Many other operators were contacted, but because they either did not wish to discuss their operations provided no pertinent information or had no experience with vapor recovery, they are omitted from this list.

Other contacts included 1) request for Dun and Bradstreet reports of several bulk plants; 2) the San Diego County Assessor's Office; 3) the Internal Revenue Service; 4) the California Pollution Board Authority; 5) the Small Business Administration; 6) the Federal Energy Administration and 7) Economists with Tait and Associates.

APPENDIX C

COMMENTS ON PROPOSED AMENDMENTS TO SAN FRANCISCO, CALIFORNIA BAY AREA AIR POLLUTION CONTROL DISTRICT REGULATIONS

BAY AREA AIR POLLUTION CONTROL DISTRICT
939 Ellis Street
San Francisco, California 94109

October 9, 1975

TO: CHAIRMAN JELAVICH AND MEMBERS OF THE BOARD OF DIRECTORS

FROM: AIR POLLUTION CONTROL OFFICER

SUBJECT: REPORT ON SMALL BULK TERMINALS - BOARD REFERRAL SEPTEMBER 17, 1975

INTRODUCTION

At the September 17, 1975 Board meeting, the staff was requested to provide a report outlining the exemptions in existing regulations for small bulk terminals, and estimates on the emissions from such terminals, along with estimates on the cost of control of such emissions.

A bulk loading plant or facility essentially consists of a number of storage tanks which store petroleum products to be used for subsequent shipment to local customers. Most of the gasoline dispensed in the Bay area is dispensed from bulk terminals at major refinery facilities, with ultimate destination of gasoline stored for service stations in the Bay area. These are referred to as major bulk loading facilities. There are a number of smaller facilities which store petroleum products for resale to farmers, smaller commercial and industrial accounts, contractors and a relatively few service stations.

Information available to the District in September of 1975 indicated that about 98% of the gasoline dispensed in the Bay area came from the larger bulk terminals associated with the major refineries, and about 2% was handled by small bulk loading facilities.

EXISTING REGULATORY CONTROL ON GASOLINE VAPORS

Regulation 3 of the District adopted in 1967 required that organic gas emissions from facilities which load more than 25,000 gallons per day of organic liquids be equipped with vapor recovery systems to reduce such emissions by at least 90%. (Section 3102.2) In addition, Regulation 3 required that organic gas emissions from facilities loading between 500 and 25,000 gallons per day of organic liquids be controlled by the installation of submerged fill pipes. (Section 3102.3)

Regulation 2 exempted service stations which are serviced from bulk terminals of less than 25,000 gallons per day throughput from installing vapor recovery equipment. (Section 1302.2b) In addition, the recent amendment by the board to the vapor recovery requirements at service stations exempted trucks which receive gasoline from bulk terminals of less than 25,000 gallons per day throughput from vapor recovery requirements on the truck. (Section 1302.2b) The exemptions in Regulation 2 concerning vapor recovery at service stations and for trucks served by the smaller bulk terminals were designed to be consistent with the earlier regulatory requirements in Regulation 3 for such small bulk terminals. That is, the need to control vapors from facilities being served by the smaller loading terminals appeared to be inconsistent with the lack of regulatory controls at the small bulk loading facilities. The basic reason was that there would be no reduction in emissions if vapors collected at the service station were emitted at the bulk terminal which was exempted from the 90% recovery requirement. For service stations which were served by major terminals which were required to have 90% vapor recovery controls, the vapors returned to the delivery truck during a "drop" would be collected at the terminal.

CONTROL OF EMISSIONS AT SMALL BULK TERMINALS

The question has been raised as to the emissions and cost of control at small bulk loading facilities. In order to assess the magnitude of the overall problem of emissions from small bulk plants, it was necessary to ascertain with greater precision the number of such plants in the District. Information was compiled in the past month from four sources available in the District. That is, from a computer printout from the registration system data bank maintained by the Enforcement Division, two summaries prepared by the Enforcement Division, and a current questionnaire survey made by the Engineering Division. A list of the small petroleum bulk loading facilities and the volume of gasoline pumped per day at each in the nine counties is attached. The first indication that there are 164 small bulk plants in the District, with a total of 255,647 gallons per day throughput, representing 4.36% of the total gasoline throughput for the Bay Area. There are however a significant number of extremely small bulk plants included in the attached list. With a cut-off of less than 500 gallons per day, the total number of bulk plants which might be affected by regulatory changes would amount to 119. In addition, there are 36 listings for which no throughput data is available, which could reduce the number of facilities affected even further. Our present estimate is that approximately 150 facilities are involved.

A small bulk plant differs in many basic features from a major bulk plant, and while there are many variations, these differences can be summarized as shown in the following table.

	MAJOR BULK PLANT	SMALL BULK PLANT
Receive product	Pipe line, barge or tanker	tank truck or rail car
Storage tanks	Floating roof or equivalent	Open vents or pressure/ vacuum relief valves
Loading rack	Vapor recovery loading arm, top and/or bottom loading	Splash or partial submerged fill; open venting
Trucks used for	5-10,000 gallons equipped for vapor recovery; gravity drop	500-5000 gallons; may have 100-1000 gallon compartments for several different products (gasoline, diesel, oil, etc.) Pressure pumps and long hoses on reels
Customers	Mainly service stations but some large commercial accounts	Farmers, smaller commercial and industrial accounts, drive-in bulk accounts, contractors, a few service stations.

SOURCES OF EMISSIONS AT SMALL BULK TERMINALS

The control problems at small bulk plants consist of at least three separate emission points:

1. Emissions from storage tank filling
2. Emissions from delivery truck loading
3. Emissions from filling customers tanks.

In essence, these emission sources are no different than the emission sources associated with major bulk loading terminals, except for the quantity of gasoline handled. Each of these areas will be discussed separately.

EMISSIONS FROM STORAGE TANK FILLING

Generally speaking, a small bulk plant has above ground storage tanks of about 30,000 to 100,000 gallons capacity for each product. These tanks are usually filled by pumping from large tank trucks or rail cars. The average throughput for small

bulk plants is about 40,000 gallons of gasoline per month, although it can be considerably higher in certain individual instances (up to 750,000 gallons per month).

From a control point of view, emissions from storage tank filling could be controlled in much the same fashion as emissions from service station tanks. That is, the requirement of vapor return lines to the delivery truck or rail car would return the vapors to the delivery vehicle for processing later. Large tank trucks are presently equipped for vapor recovery and the vapors are returned to the major bulk plants, which has equipment for processing the vapor further. Small delivery trucks are not so equipped.

The cost of vapor return equipment for the delivery of fuel to the storage tanks of small bulk plants appears to be technically feasible, and estimates are that the cost would be in the same range as for service stations, that is, about $1,000 to $10,000 per storage tank. In general, construction problems would be less difficult than at service stations because most of the tanks are above ground. The total emissions from this source is on the order of 0.9 tons per day from all of the small bulk loading facilities in the Bay Area.

LOADING RACK CONTROL

The processing of vapors at the small bulk terminal returned by delivery trucks would require the installation of secondary recovery systems, such as are now required for the large bulk loading racks. This would require the use of vapor recovery loading arms, or other vapor recovery processing units. Such units, which are now available, are sealed for the 25,000 gallons per day and greater facility. The cost of such systems is in the range of $150,000 and higher, depending upon the throughput. The smaller bulk loading racks would require smaller capacity recovery systems, which appear to be technically feasible and costs would probably be in the $10,000 to $15,000 range, depending upon throughput. The emission from this source is on the order of 1.3 tons per day in the Bay Area.

DELIVERY TRUCK CONTROL

The control of vapors, which are emitted upon delivery of fuel to the customers of small bulk loading racks, may be the most difficult phase of small bulk terminal control. A major problem with the smaller truck used by these bulk loading installations is that many of them are equipped with pumps, whereas the large truck delivery is mainly by gravity drop. The small trucks generally have hose reels and very long hoses to access remote and difficult fill operations. A vapor return hose would be required together with a special vapor recovery nozzle. It is difficult to estimate

the costs, as we are not familiar with any such installations, but based on available data, it could be in the range of $5,000 to $15,000 per truck. In addition to the installation of specialized equipment on the delivery vehicle, it would be necessary for the customer (farmer, contractor, etc.) to install the necessary hardware on his storage tank to accommodate the vapor return line of the delivery vehicle. Since most of these tanks are above ground, the cost of such equipment should not exceed approximately $100 per tank.

The emissions from this source are estimated to be on the order of 1.5 tons per day for the entire Bay area.

The following table summarizes the information discussed above.

SUMMARY OF EMISSIONS AND COST ESTIMATES FOR CONTROL AT SMALL BULK LOADING FACILITIES AND DELIVERIES THEREFROM

Source	Estimated Emissions T/D	Estimated Cost Per Facility
Filling storage tanks	0.9	$3,000 - $10,000
Filling delivery trucks (loading back recovery)	1.3	$10,000 - $15,000
Filling customers tanks	1.5	($5,000 - $15,000 (for truck equipment ($100 for customer (tank equipment
TOTAL	3.7	

For 130 small bulk loading facilities in the Bay area, which would be subject to such controls, the following total cost estimates are presented:

Filling Storage Tanks		$387,000 to $1,300,000
Filling Delivery Trucks (loading back recovery)		$1,300,000 to $1,938,000
Filling Customers Tanks		
	Trucks	Number of trucks not known at this time
	Customers	Number of tanks not known at this time

For comparison purposes relative to the emissions from gasoline marketing in the Bay area, the following data is presented in summary form:

Source	Gallons/Day Pumped	Total Emissions T/D
Small bulk terminals	355,000	3.7
Major bulk terminals	6,000,000	75

A break down of the number of facilities and county distribution is shown in the following table:

SUMMARY
SMALL BULK PLANT DATA

County	Plants	Less Than 500 Gal/Day	Total Gal/Day	Organic Emissions Tons/Day
ALAMEDA	35	8	47,145	.6836
CONTRA COSTA	26	12	40,529	.5876
MARIN	7	3	10,050	.146
NAPA	15	4	40,653	.589
SAN FRANCISCO	8	3	1,117	.016
SAN MATEO	16	1	17,048	.247
SANTA CLARA	23	2	25,860	.375
SOLANO	11	0	6,829	.099
SONOMA	21	2	66,416	.963
TOTAL	164	35	255,647	3.7

The Board has indicated that it wished to study the information, which is currently available, relative to the emissions and the feasibility of control at small bulk loading facilities and trucks which serve these facilities. The staff will be pleased to respond to any questions the Board may have.

DJC:MF:tmm

BAY AREA AIR POLLUTION CONTROL DISTRICT
939 Ellis Street
San Francisco, California 94109

January 14, 1976

TO: CHAIRMAN WILLIAM B. JELAVICH AND MEMBERS OF THE BOARD OF DIRECTORS

FROM: AIR POLLUTION CONTROL OFFICER

SUBJECT: PROPOSED AMENDMENTS TO REGULATIONS 2 AND 3 CONCERNING BULK LOADING TERMINALS AND THE REDUCTION OF EMISSIONS THEREFROM

The Board of Directors has directed the staff to propose amendments to District regulations which would further limit the emissions of organic compounds from Bulk Loading Terminals. At the present time, Regulation 3 requires 90% recovery of vapors emanating from Bulk Loading Terminals of greater than 25,000 gallon per day throughput (Regulation 3, Section 3102.2). Regulation 2, Section 1302.22 b, exempts storage tanks from the vapor recovery requirements of Section 1302.2 if they are served by bulk loading terminals which process less than 25,000 gallons per day.

Vapors of gasoline are emitted to the atmosphere during the marketing of gasoline at the following sources:

(1) The filling of storage tanks at small (less than 25,000 gallons per day throughput) bulk loading facilities.

(2) The filling of transportable tanks from such storage facilities.

(3) The filling of tanks at service stations and other end-users by these delivery trucks.

Controls presently exist for recovery of vapors from the larger (greater than 25,000 gallons per day throughput) bulk loading terminals, the transportable tankers which deliver product to service stations, and the service station tanks served by these transportable tankers.

In order to further limit the emissions of organic vapors from smaller bulk loading terminals, the transportable tankers which deliver product to end-user, and the storage tanks of the end-user, a series of existing regulations could be amended.

The staff proposes a series of such amendments to Regulations 2 and 3 to accomplish further reduction in emissions from activities associated with gasoline marketing from smaller bulk loading terminals. These amendments are designed to accomplish the following:

(1) For the filling of storage tanks of greater than 1,000 barrels (42,000 gallons), no change from the present requirement of a floating roof (Regulation 5, Sections 5102.4 and 5102.5).

(2) For the filling of storage tanks of a size between 2,000 gallons and 42,000 gallons (1,000 barrels), a new requirement for a vapor balance system to control emissions resulting from the filling of such tanks.

(3) For the filling of tanks smaller than 2,000 gallons, the requirement of submerged fill.

(4) For the filling of transportable containers (tankers) from bulk loading plants processing more than 25,000 gallons per day, no change from the present requirement of 90% control (Regulation 5, Section 5102.2).

(5) For the filling of transportable containers (tankers) from bulk loading plants processing between 2,500 and 25,000 gallons per day, the requirement of a vapor balance system for such loading of tankers.

(6) For the filling of transportable containers (tankers) from bulk loading facilities processing less than 2,500 gallons per day, the requirement of a submerged fill pipe.

(7) For the filling of storage tanks at end-users (i.e. service stations) serviced by bulk loading terminals processing more than 25,000 gallons per day, no change from present regulatory requirements of 90% control (Regulation 2, Section 1302.2).

(8) For the filling of storage tanks at end-users (i.e. service stations) serviced by bulk plants of between 2,500 and 25,000 gallons per day throughput, the requirement of 90% control.

(9) For the filling of storage tanks at end-users serviced from bulk plants of less than 2,500 gallons per day throughput, or serviced by bulk distributors who deliver less than 2,500 gallons per day, the requirement of a submerged fill pipe.

Adoption of the proposed amendments to Regulations 2 and 5 to accomplish the above will result in the following:

(1) Reduction of organic emissions by approximately 2 tons per day.

(2) Approximately 35 facilities in the Bay Area may be affected.

(3) Estimated cost of control to achieve the above reduction would be approximately $500,000, involving the installation of vapor balance systems.

Attached are the recommended changes to Regulations 2 and 3 which would accomplish these reductions.

The staff recommends that these amendments be adopted.

BJC:MP:jd
Attachments

PROPOSED AMENDMENTS TO REGULATION 3

(Organic Storage Tanks)

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§ 3102 Compliance with any of sections 3102.1 through 3102.6 shall be deemed to be in compliance with Section 3101. Showing of such compliance by the person responsible for an organic gas emission shall include applicable portions and/or calculation procedures contained in API Bulletin 2514, "Evaporation Loss from Tank Cars, Tank Trucks and Marine Vessels," in API Bulletin 2517, "Evaporation Loss from Floating Roof Tanks," and in API Bulletin 2518, "Evaporation Loss from Fixed Roof Tanks."

§ 3102.1 Organic gas emissions from a stationary storage tank of equal to or less than 1,000 barrels capacity and containing organic liquids with a vapor pressure greater than 1.5 psia under actual storage conditions and a head space reactivity greater than 85% shall not exceed that amount which would be emitted if the tank were filled through a submerged fill pipe.

3102.1 ORGANIC GAS EMISSIONS FROM THE FILLING OF A STATIONARY STORAGE TANK OF LESS THAN 2,000 GALLONS CAPACITY AND CONTAINING ORGANIC LIQUIDS WITH A VAPOR PRESSURE GREATER THAN 1.5 PSIA UNDER ACTUAL STORAGE CONDITIONS SHALL NOT EXCEED THAT AMOUNT OF ORGANIC GAS EMISSION WHICH THE SAME TANK, CONTAINING THE SAME LIQUID, WOULD EMIT IF EQUIPPED WITH A SUBMERGED FILL PIPE.

3102.11 ORGANIC GAS EMISSIONS FROM THE FILLING OF A STATIONARY STORAGE TANK OF CAPACITY ORGANIC THAT BE EQUAL TO 2,000 GALLONS BUT LESS THAT BE EQUAL TO 42,000 GALLONS AND CONTAINING ORGANIC LIQUIDS WITH A VAPOR PRESSURE GREATER THAN 1.5 PSIA UNDER ACTUAL STORAGE CONDITIONS SHALL NOT EXCEED THAT AMOUNT OF ORGANIC GAS EMISSION WHICH THE SAME TANK, CONTAINING THE SAME LIQUID, WOULD EMIT IF EQUIPPED WITH A VAPOR BALANCE SYSTEM IN GOOD CONDITION.

§ 3102.4 Organic gas emissions from a stationary storage tank which has a storage capacity greater than 1,000 barrels, and which contains organic liquid having a vapor pressure under actual storage conditions greater than 1.5 psia but equal to or less than 11 psia and a head space reactivity greater than 85%, shall not exceed that amount of organic gas emission which the same tank, containing the same organic liquid, would emit if equipped with a floating roof in good condition. Such organic gas emissions shall be calculated according to API Bulletin 2517, "Evaporation Loss from Floating Roof Tanks," or shall be calculated by applicable procedures acceptable to the Control Officer where API Bulletin 2517 procedures are not valid.

§ 3102.5 Organic gas emissions from a stationary storage tank which has a storage capacity greater than 1,000 barrels and which contains organic liquid having a vapor pressure under actual storage conditions greater than 11.0 psia and a head space reactivity greater than 85% shall not exceed that amount of organic gas emission which the same tank, containing the same organic liquid, would emit if it were storing an organic liquid of 11 psia vapor pressure and were equipped with a floating roof in good condition. Such organic gas emission shall be calculated according to API Bulletin 2517.

PROPOSED AMENDMENTS TO REGULATION 3

(BULK LOADING FACILITIES)

~~§ 3102.2 Organic gas emissions calculated as a liquid from a facility loading more than 20,000 gallons per calendar day of organic liquids with a Reid vapor pressure greater than 4 psia, head space reactivity greater than X% into transportable containers larger than 100 gallons capacity shall be reduced by at least 90% of the amount that would be emitted without controls. (Amended October 8, 1974)~~

~~§ 3102.3 Organic gas emissions from a facility loading between 500 and 20,000 gallons per calendar day of organic liquids with a Reid vapor pressure greater than 4 psia and a head space reactivity greater than X % into transportable containers larger than 10 gallons capacity shall not exceed that amount which would be emitted if the containers were filled through a submerged fill pipe.~~

3102.2 ORGANIC GAS EMISSIONS FROM THE FILLING OF TRANSPORTABLE CONTAINERS OF GREATER THAN 100 GALLONS CAPACITY WITH ORGANIC LIQUIDS HAVING VAPOR PRESSURES GREATER THAN 1.5 PSIA, AT BULK PLANTS LOADING MORE THAN 20,000 GALLONS PER CALENDAR DAY INTO SUCH TRANSPORTABLE CONTAINERS, SHALL BE REDUCED BY AT LEAST 90% OF THE AMOUNT THAT WOULD BE EMITTED WITHOUT CONTROLS.

3102.21 ORGANIC GAS EMISSIONS FROM THE FILLING OF TRANSPORTABLE CONTAINERS OF GREATER THAN 100 GALLONS CAPACITY WITH ORGANIC LIQUIDS HAVING VAPOR PRESSURES GREATER THAN 1.5 PSIA, AT BULK PLANTS LOADING AT LEAST 2,500 GALLONS PER CALENDAR DAY BUT NOT MORE THAN 20,000 GALLONS PER CALENDAR DAY INTO SUCH TRANSPORTABLE CONTAINERS, SHALL NOT EXCEED THAT AMOUNT WHICH COULD BE EMITTED IF THE ORGANIC GAS EMISSIONS WERE CONTROLLED BY A VAPOR BALANCE SYSTEM.

3102.3 ORGANIC GAS EMISSIONS FROM THE FILLING OF TRANSPORTABLE CONTAINERS OF GREATER THAN 100 GALLONS CAPACITY WITH ORGANIC LIQUIDS HAVING VAPOR PRESSURES GREATER THAN 1.5 PSIA, AT BULK PLANTS LOADING LESS THAN 2,500 GALLONS PER CALENDAR DAY INTO SUCH TRANSPORTABLE CONTAINERS, SHALL NOT EXCEED THAT AMOUNT WHICH WOULD BE EMITTED IF THE CONTAINERS WERE FILLED THROUGH A SUBMERGED FILL PIPE.

PROPOSED AMENDMENTS TO
REGULATION 3

(DEFINITIONS)

2006.1 BULK PLANT MEANS ANY FACILITY WHICH RECEIVES LIQUID ORGANICS, STORES THE LIQUID IN STATIONARY STORAGE TANKS, AND LOADS FROM THOSE STORAGE TANKS INTO TRANSPORTABLE CONTAINERS FOR FURTHER DISTRIBUTION.

2043.1 VAPOR BALANCE SYSTEM MEANS A SYSTEM CONSISTING OF TWO OR MORE TANKS WHERE THE VAPOR SPACES ARE INTERCONNECTED IN SUCH A WAY THAT WHEN LIQUID IS TRANSFERRED FROM ONE TO THE OTHER THE VAPORS DRIVEN FROM THE TANK RECEIVING THE LIQUID INTO THE VAPOR SPACE OF THE TANK FROM WHICH THE LIQUID IS REMOVED TEND BALANCE TO EQUALIZE THE PRESSURE IN THE VAPOR SPACE OF THE INTERCONNECTED TANKS.

PROPOSED AMENDMENTS TO REGULATION 2

VAPOR RECOVERY FROM STORAGE TANKS

§ 1302.22 The Air Pollution Control Officer shall not deny an authority to operate for containers, reservoirs or tanks used exclusively for:

(a) The storage of gasoline having a capacity equal to or less than 2000 gallons and with a throughput of 6000 gallons per month or less.

Delete

(b) The storage of gasoline serviced from bulk terminals of less than 25,000 gallons per day throughput. Such tanks shall comply with the vapor recovery requirements of § 1302.2 within 90 days of a change in service which results in deliveries from bulk terminals of 25,000 gallons per day throughput or more.

Add

(b) THE STORAGE OF GASOLINE WHEN SUPPLIED FROM BULK DISTRIBUTORS OF LESS THAN 2,500 GALLONS PER CALENDAR DAY THROUGHPUT OR FROM BULK PLANTS OF LESS THAN 2,500 GALLONS PER CALENDAR DAY THROUGHPUT. SUCH TANKS SHALL COMPLY WITH THE VAPOR RECOVERY REQUIREMENTS OF §1302.2 WITHIN 90 DAYS OF A CHANGE IN SERVICE WHICH RESULTS IN DELIVERIES FROM BULK DISTRIBUTORS OR BULK PLANTS OF 2,500 GALLONS PER CALENDAR DAY THROUGHPUT OR MORE.

(c) The storage of gasoline in structures which the Air Pollution Control Officer has determined that severe and unusual construction problems would prevent the installation of equipment to meet the vapor recovery requirements specified in Section 1302.2. Such unusual construction problems include but are not limited to tanks with offset fill lines, tanks located in the basements of office buildings or under roadways.

(d) The storage of gasoline and whose operation will cease on or before July 1, 1975 upon presentation of adequate supporting documents to the Air Pollution Control Officer. This exemption from the vapor recovery requirements specified in 1302.2 shall not apply if the operation ceases prior to July 1, 1975 and recommences operation after July 1, 1975. *(Adopted June 10, 1974; June 30, 1976.)*

Add

(e) THE STORAGE OF GASOLINE IN STORAGE TANKS USED EXCLUSIVELY FOR THE FUELING OF IMPLEMENTS OF HUSBANDRY.

PROPOSED AMENDMENTS TO REGULATION 2

DEFINITIONS

Add

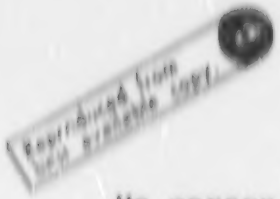
2013.1 BULK DISTRIBUTOR MEANS ANY PERSON WHICH RECEIVES ORGANIC LIQUIDS FROM A BULK PLANT AND DELIVERS THOSE ORGANIC LIQUIDS TO STATIONARY STORAGE TANKS.

2013.2 BULK PLANT MEANS ANY FACILITY WHICH RECEIVES ORGANIC LIQUIDS, STORES THE LIQUID IN STATIONARY STORAGE TANKS, AND LOADS FROM THOSE STORAGE TANKS INTO TRANSPORTABLE CONTAINERS FOR FURTHER DISTRIBUTION.

2013.3 QUANTITY PER CALENDAR DAY MEANS THE QUANTITY PER CALENDAR YEAR DIVIDED BY 365.

PROPOSED AMENDMENTS TO REGULATION 2

GASOLINE DELIVERY VEHICLES



1302.21 a) No person shall store gasoline in or otherwise use or operate any gasoline delivery vehicle used for the delivery of gasoline for the servicing of motor vehicles unless he shall first have obtained written authorization for such operation from the Air Pollution Control Officer. The Air Pollution Control Officer shall not deny authorization for such use or operation if such vehicle is designed and maintained to be vapor-tight and if such vehicle is equipped with a system to recover at least 90% of the gasoline vapors displaced during the transfer of gasoline from the vehicle to storage tanks used to service motor vehicles. Any person who delivers or authorizes the delivery of gasoline to storage tanks without the proper connection of the vapor recovery system to the storage tank shall be deemed to be in violation of this Section.

b) ~~Gasoline delivery vehicles serviced solely from bulk plants of less than 2,500 gallons per calendar day throughput and gasoline delivery vehicles owned and operated by bulk distributors of less than 2,500 gallons per calendar day throughput are exempted from the requirements of 1302.21 (a).~~

b) GASOLINE DELIVERY VEHICLES SERVICED SOLELY FROM BULK PLANTS OF LESS THAN 2,500 GALLONS PER CALENDAR DAY THROUGHPUT AND GASOLINE DELIVERY VEHICLES OWNED AND OPERATED BY BULK DISTRIBUTORS OF LESS THAN 2,500 GALLONS PER CALENDAR DAY THROUGHPUT ARE EXEMPTED FROM THE REQUIREMENTS OF 1302.21 (a).

APPENDIX D

SUMMARY OF EMISSION INVENTORY AND COST ANALYSIS BY MISSOURI DEPARTMENT OF NATURAL RESOURCES

PROPOSED REGULATION XXI

SUMMARY OF EMISSION INVENTORY AND COST ANALYSIS

In trying to draft a workable regulation XXI the Air Quality staff realized that an accurate emission inventory needed to be assembled for the St. Louis Area. Through the cooperation and information supplied by the petroleum industry, that inventory has been completed along with a cost/benefit analysis. The following is a summary of those results.

- Total hydrocarbon (HC) emissions for the St. Louis Metropolitan Area have been approximated at 122,000 tons per year (TPY) of which 81,500 tons is from mobile sources and 40,540 is from point and area sources.
- With the existing level of control the gasoline marketing industry contributes 9769 TPY or 8% of the total. Requiring only submerged filling at all facilities would reduce emissions to 8713 TPY or a 0.86% reduction. Although the cost/benefit is $125 per ton of HC controlled, the emission reduction is not very substantial. Various alternatives that were analyzed were:

  A - Exempt all bulk plants ≤100,000 gallons per month (gpm)
  B - Exempt all bulk plants ≤100,000 gpm from Section D only
  C - Exempt all bulk plants ≤100,000 gpm from Section C only
  D - No exemptions

It was determined that strategy C had the best (lowest) cost/benefit ratio while still giving a substantial HC reduction. Emissions would be reduced by 1.64% with a cost/benefit ratio of $1362/ton of HC controlled. Maximum control (Strategy D) would give a 1.72% reduction (0.08% reduction over C) at a cost/benefit of $1584/ton.

To obtain an idea of what this figure means, a cost/benefit was performed on installing an electrostatic precipitator to control particulates from a power plant. The example was the Chamois Power Plant where ESP costs were $2,000,000 to collect an additional 7205 TPY of particulates. This corresponds to $277/ton of pollutant controlled. Thus we see that this regulation costs about six times as much per ton of pollutant reduced.

- Based on the accumulated data, a fourth draft of the regulation has been prepared. The changes are:

  1. Section A.3. - The words "all" and "prevent" were replaced by "the" and "limit" to avoid any implication of 100% efficiency.

  2. Section B.1. - The psia limit was raised to 1.8 to exempt benzene.

  3. Section C.2.A. - Raising the emission limitation from 0.4 to 0.5 gram per gallon was made to account for the ranges of inlet concentrations to the vapor recovery unit. This would represent an 88-92% efficiency on the unit.

4. Section C.3. - This was an addition to provide for the exemption of the small loading facilities that are expensive to control and produce small emission reductions. This is what is referred to as Strategy C. However, all new facilities must comply with the regulation.

5. Section D.1.c.(2) - This addition helped to further clarify the regulation's applicability.

6. Section D.2.d. - This addition was necessary due to the exemption given to the small loading facilities.

7. Section E.1. - Compliance dates were extended due to slow delivery times for equipment.

EMISSION INVENTORY

Bulk Terminals

Number: 9

Tanks: 42
Floating or lifter roof = 38
Fixed roof = 4

Throughput: 702,606,176 gallons per year (gpy)
Trucks = 671,226,172 gpy
Barges = 31,382,004 gpy

Emissions: Tons/year (tpy)

Uncontrolled	Existing Control	Submerged Fill Only	Full Vapor Recovery .4 gm/gal	Full Vapor Recovery .5 gm/gal
10,105	2,107	2,049	754	828

Note: Not readily seen in the above figures is an emission elimination at the bulk terminal when loading each vapor laden tank truck. The tank truck full of vapors prevents the emission of vapors that would ordinarily occur when gasoline is loaded into an empty truck, therefore, there is almost a double savings.

Bulk Plants

Number: 42

Throughput: 51,800,796
All bulk plants reporting had average monthly throughputs of less than or equal to 300,000 gallons.

Emissions: (tpy)

Uncontrolled	Existing Control	A	B	C	D
791	679	575	491	376	281

A = Exempt plants ≤300,000 gallons per month (gpm) from Sections C & D if trucks are filled with submerged fill pipe.

B = Exempt plants ≤300,000 gpm from Section D.

C = Exempt plants ≤300,000 gpm from Section C if trucks are filled with a submerged fill pipe.

D = No exemptions.

Service Stations

*Number: Approximately 1500

*Throughput: Approximately 600,000,000 gallons/year

Emissions: (tpy)

Uncontrolled	Existing Control	Submerged Fill Only	Vapor Balance
7050	6781	6090	4119

*We did not have a very complete response as to number of stations and gasoline throughput. These numbers were picked based upon vehicle miles traveled, population, and information supplied by the oil industry.

Total Emissions

	Uncontrolled	Existing	Submerged Fill Only	A	B	C	Full Vapor Recovery
Terminals	10,105	2307	3048	828	828	828	828
Plants	791	679	575	575	491	376	281
Stations	7,050	6781	6090	4119	4119	4119	4119
	17,946	9769	8713	5522	5438	5323	5228

Total hydrocarbon emissions for the St. Louis Metropolitan Area are approximately 122,000 tons/year of which 81,500 tons is from mobile sources and 40,500 tons is from point and area sources.

Emission Reduction (120,000 tpy total)

	% of total	From (TPY)	To (TPY)	% Reduction
Existing Contribution	8.0	9769	9769	0
Submerged Fill Only	7.14	9769	8713	.86
A	4.52	9769	5522	1.40
B	4.45	9769	5438	1.55
C	4.36	9769	5321	1.64
D	4.28	9769	5228	1.72
Changing from 0.4 to 0.5 gm/gallon		754	828	0.06

COST ANALYSIS

Terminals:

9 vapor recovery units @$250,000		$2,100,000
4 floating roof retrofits @$30,000		120,000
	TOTAL	$2,420,000

Bulk Plants (42)

To comply with Section B - $2000/plant		$ 84,000
To comply with Section C -		
$15,000/plant (vapor balance)		630,000
4,000/truck (100 trucks)		400,000
	TOTAL	$1,114,000

Service Stations (1500)

1500 stations @$2500/station	$3,750,000

Trucks (200)

Cost to convert trucks	$1,000,000

COST/BENEFIT OF VARIOUS ALTERNATIVES

1. Require only submerged fill

Cost ($)	Benefit (tons HC)	Cost/Benefit
131,800	1056	$125/ton or $.47/gal

2. Exemption A

Cost ($)	Benefit (tons HC)	Cost/Benefit
2,420,000	4247	$1609/ton or $6.13/gal
1,750,000		
1,000,000		
7,170,000		

3. Exemption B

Cost ($)	Benefit (tons HC)	Cost/Benefit
2,420,000	5438	$1507/ton or $5.65/gal.
630,000		
400,000		
1,750,000		
1,000,000		
8,200,000		

4. Exemption C

Cost ($)	Benefit (tons HC)	Cost/Benefit
2,420,000	5123	$1362/ton
84,000		or
1,750,000		$5.10/gal
1,000,000		
7,254,000		

5. Exemption D

Cost ($)	Benefit (tons HC)	Cost/Benefit
2,420,000	5723	$1584/ton
84,000		or
230,000		$5.94/gal
400,000		
1,750,000		
1,000,000		
5,204,000		